Hitachi Gigabit Router
GR2000 Series

Installation Guide

HITACHI
internetworking

GR2K-GA-1002
Rev. 6.03

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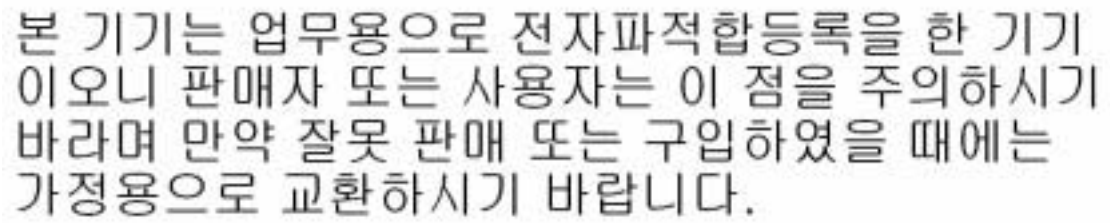

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Change Record

Revision No.	Date	Description	Affected Pages
	March 2000	Original Edition	All
1	April 2000	Conversion to HICAM format	All
2	May 2000	Edit Pass prior to release	All
A	June 2000	Final Release	All
B	August 2000	Edit by ESD	All
C	November 2000	Release 3.00	All
3.02	January 2001	Release 3.02	All
4.00	May 2001	Release 4.00	All

Preface

This manual provides the installation instructions for the GR2000 Gigabit Router. The manual is intended for personnel involved in installation planning and setting-up of the product.

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Acknowledgments

[GateD]

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Gate Daemon was originated and developed through release 3.0 by Cornell University and its collaborators.

[SNMP]

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Erik Schoenfelder (schoenfr@ibr.cs.tu-bs.de): additions, fixes and enhancements for Linux by 1994/1995.

David Waitzman: Reorganization in 1996.

Wes Hardaker <hardaker@ece.ucdavis.edu>: Some bug fixes in his UC

Davis CMU SNMP distribution were adopted by David Waitzman

David Thaler <thalerd@eecs.umich.edu>: Some of the code for making the agent embeddable into another application was adopted by David Waitzman

Many more over the years...

[BSDI Internet Server]

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This implementation has been influenced by the CMU SNMP release, by Steve Waldbusser. However, this shares no code with that system. Additional ASN.1 insight gained from Marshall T. Rose's _The_Open_Book_. Earlier forms of this implementation were derived and/or inspired by an awk script originally written by C. Philip Wood of LANL (but later heavily modified by John Robert LoVerso). The copyright notice for that work is preserved below, even though it may not rightly apply to this file.

This started out as a very simple program, but the incremental decoding (into the BE structure) complicated things.

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[zlib]

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[MD5 Program]

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MD5 Message-Digest Algorithm.

[pimdd]

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Abbreviations

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
ACK	ACKnowledge
AFI	Authority and Format Indicator
AIS	Alarm Indication Signal
ANSI	American National Standards Institute
APS	Automatic Protection Switching
ARP	Address Resolution Protocol
AS	Autonomous System
ATM	Asynchronous Transfer Mode
BECN	Backward Explicit Congestion Notification
BGP	Border Gateway Protocol
BGP4	Border Gateway Protocol 4
BGP4+	Multiprotocol Extensions for Border Gateway Protocol - version 4
BOD	Bandwidth On Demand
BPDU	Bridge Protocol Data Unit
bps	bits per second
BRI	Basic Rate Interface
BSR	BootStrap Router
CATV	Cable Television
CBR	Constant Bit Rate
CIDR	Classless Inter-Domain Routing
CIR	Committed Information Rate
CLLM	Consolidated Link Layer Management
CLNP	Connectionless Network Protocol
CLP	Cell Loss Priority
CNTL	CoNTrol
CRC	Cyclic Redundancy Check
CR-LDP	Constraint-Based Label Distribution Protocol
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
DA	Destination Address
DCC	Data Country Code
DCE	Data Circuit terminating Equipment

DDP	Datagram Delivery Protocol
DHCP	Dynamic Host Configuration Protocol
DLCI	Data Link Connection Identifier
DR	Designated Router
DSAP	Destination Service Access Point
DSCP	Differentiated Services Code Point
DSP	Domain Specific Part
DSU	Digital Service Unit
DTE	Data Terminal Equipment
DVMRP	Distance Vector Multicast Routing Protocol
ELAN	Emulated LAN
ERP	Echo Response
ERQ	Echo Request
ES	End System
FCS	Frame Check Sequence
FDB	Filtering Data Base
FDDI	Fiber Distributed Data Interface
FEC	Forwarding Equivalence Class
FECN	Forward Explicit Congestion Notification
FERF	Far End Receive Failure
FR	Frame Relay
GFR	Guaranteed Frame Rate
HDLC	High-level Data Link Control
HNA	Hitachi Network Architecture
ICMP	Internet Control Message Protocol
ICMPv6	Internet Control Message Protocol version 6
ID	Identifier
IDI	Initial Domain Identifier
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IETF	the Internet Engineering Task Force
IGMP	Internet Group Management Protocol
ILMI	Interim Local Management Interface
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IPV6CP	IPv6 Control Protocol

IPX	Internetwork Packet Exchange
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISP	Internet Service Provider
ITU-T	International Telecommunication Union - Telecommunication, Standardization Sector
JDI	Japanese Domain Identifier
NAK	Not AcKnowledge
LAN	Local Area Network
LAPB	Link Access Procedure Balanced Mode
LCP	Link Control Protocol
LDP	Label Distribution Protocol
LEC	LAN Emulation Client
LES	LAN Emulation Server
LIS	Logical IP Subnetwork
LLB	Local Loop Back
LLC	Logical Link Control
LQM	Link Quality Monitoring
LQR	Link Quality Report
LSP	Label Switched Path
LSR	Label Switched Router
MAC	Media Access Control
MC	Memory Card
MD5	Message Digest 5
MIB	Management Information Base
MMF	Multi Mode Fiber
MPLS	Multi-Protocol Label Switching
MRU	Maximum Receive Unit
NSAP	Network Service Access Point
MTU	Maximum Transfer Unit
Nak	Not AcKnowledge
NBP	Name Binding Protocol
NCP	Network Control Protocol
NDP	Neighbor Discovery Protocol
NET	Network Entity Title
NetBIOS	Network Basic Input/Output System

NIF	Network Interface board
NLP	Network Layer Protocol
NRZ	Non-Return-to-Zero
NSAP	Network Service Access Point
NSSA	Not So Stubby Area
NTP	Network Time Protocol
PAD	PADding
OC-3c	Optical Carrier level 3 concatenation
OC-12c	Optical Carrier level 12 concatenation
OC-48c	Optical Carrier level 48 concatetenation
OAM	Operation Administration and Management
ONU	Optical Network Unit
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First
OUI	Organizationally Unique Identifier
PAD	PADding
PC	Personal Computer
PDB	Permanent Data Base
PDU	Protocol Data Unit
PHY	PHYsical layer protocol
PID	Protocol IDentifier
PIM	Protocol Independent Multicast
PIM-DM	Protocol Independent Multicast-Dense Mode
PIM-SM	Protocol Independent Multicast-Sparse Mode
PLD	Programmable Logic Design
POS	PPP over SONET/SDH
PPP	Point-to-Point Protocol
PPS	Packet Per Second
PRI	Primary Rate Interface
PVC	Permanent Virtual Channel (Connection)/Permanent Virtual Circuit
QoS	Quality of Service
RA	Router Advertisement
RDI	Remote Defect Indication
Rej	REJect
RFC	Request For Comments

RIP	Routing Information Protocol
RIPng	Routing Information Protocol next generation
RLB	Remote Loop Back
RM	Routing Manager
RMON	Remote Network Monitoring MIB
RP	Routing Processor
RPF	Reverse Path Forwarding
RQ	ReQuest
RSVP	Resource Reservation Protocol
SA	Source Address
SAP	Service Access Point
SD	Start Delimiter
SDH	Synchronous Digital Hierarchy
SDLC	Service Advertising Protocol
SD-I	Super Digital I interface
SDU	Service Data Unit
SFD	Start Frame Delimiter
SMF	Single Mode Fiber
SNA	Systems Networking Architecture
SNAP	Sub-Network Access Protocol
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
SPF	Shortest Path First
SPT	Spanning Tree
SPX	Sequenced Packet Exchange
SSAP	Source Service Access Point
SSP	Switch to Switch Protocol
SVC	Switched Virtual Channel (Connection)
TA	Terminal Adapter
TCC	Transmission Control Character
TCP/IP	Transmission Control Protocol/Internet Protocol
TOS	Type Of Service
TTC	Telecommunication Technology Committee
TTL	Time To Live
UBR	Unspecified Bit Rate
UDP	User Datagram Protocol

UNI	User Network Interface
UPC	Usage Parameter Control
VBR	Variable Bit Rate
VC	Virtual Channel/Virtual Call
VCI	Virtual Channel Identifier
VLAN	Virtual LAN
VP	Virtual Path
VPI	Virtual Path Identifier
VPN	Virtual Private Network
VRRP	Virtual Router Redundancy Protocol
WAN	Wide Area Network
WS	Work Station
WWW	World-Wide Web
xDSL	x Digital Subscriber Line

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Safety Guide

This document provides safety-related notices for use of the GR2000 Gigabit Router. Read the following Safety Guidelines carefully before using the product and follow them to take full advantage of the GR2000's features.

General Safety Guidelines

- Perform all operations in accordance with the instructions and procedures as described in the product manuals.
- Be alert and use common sense. The hazard warnings cannot cover every possible situation. Do not perform any operations not described in the documentation. In the event of a problem, turn off the power, unplug the power cable, and contact a qualified service technician.
- Follow all precautionary and hazard messages on the GR2000 and in the documentation. Failure to do so may result in bodily injury, damage to the device, or an interruption in service.
- The hazard warnings on the machine or in the manual have the following headings and symbols, CAUTION or WARNING. Hazard warnings on the device and in the manuals are provided to prevent or reduce risk of death, personal injury, or product damage. Understand and follow these hazard warnings:

Caution: **This is a caution notice. Follow the instructions in this notice to avoid damage to the equipment or a disruption in service.**

WARNING: **This is a warning notice. Follow the instructions in this notice to avoid the possibility of bodily injury occurring.**

The following sections have specific instructions regarding warnings and cautions.

Specific Warning Instructions

WARNING: Failure to follow the instructions in this section could cause bodily injury or death to the user.

- Do not operate the device if you suspect damage or failure.
- Do not use the device if there is smoke or an unusual smell coming from the system. If either occurs, immediately turn power off and unplug the power cable from the outlet. Contact a qualified service technician.
- In the case of the GR2000-20H, GR2000-10H, or GR2000-6H with DC power supplies installed, turn off the circuit breaker on the power facility supply side.
- If the device is installed in a rack, unplug the device power cable from the rack outlet. If the component with the problem cannot be identified, remove all power cables from the rack outlet. Contact a qualified service technician.
- In the case of redundant power supplies, make sure that ALL switches and circuit breakers are turned off.
- If the device is dropped and any part is broken, turn the power switch off, unplug the power cable from the outlet, and contact service. Continued use may cause fire or electric shock.
- Do not use any unspecified power source or power voltage. Observe all terminal ratings and markings on the product.
- To prevent electric shock, use only grounded power outlets when using AC power. Do not overload power outlets. In the case of DC power or the GR2000-20H, use a ground wire to prevent electric shock.
- Do not use adapters to connect multiple power cables to the same outlet. Use standard safety procedures with the power cable.
- Use only the power cable supplied with the device. Use of other cables may cause fire or electric shock. Keep the power cable away from extreme heat.
- Similarly, do not use the provided power cable for products other than the GR2000, since this could cause a fire or electrical shock hazard.
- Do not operate the device in wet or damp conditions
- If liquid is spilled on the device, turn power off and unplug the power cable from the outlet. Discontinue use to avoid the risk of fire or electric shock.
- Place device on a stable, level surface. Do not place or stack objects on top of the device.
- If a foreign object falls into the device, turn power off and unplug the power cable from the outlet. Do not attempt to remove the object while the power is on.
- Do not remove the device's cover while the device is in operation.
- Touching internal parts may cause electric shock. Contact a qualified service technician for any internal inspection, adjustment or repair. Do not modify the device. Doing so may cause fire or electric shock.
- Do not insert any foreign objects into the device or the ventilation slots. Doing so may cause fire or electric shock.
- Do not insert hands or any other object into a fan.
- Do not allow unauthorized users of the device to pull out boards or power supplies at any time.
- Do not set the GR2000 in a dusty or humid location. Doing so may cause fire or electric shock.

- This router contains a lithium battery for the real-time clock. Mishandling this battery may cause heat build-up, damage, or in an extreme case, explosion or fire.
  - Do not remove the battery from the device, disassemble it, or expose it to temperatures of over 100°C (212°F)
  - Do not throw or immerse lithium batteries into water.
  - Dispose of exhausted batteries as required by local regulations.
- Remove dust on and around the device regularly. Dust buildup can cause fire or electrical shock, and can result in failure of the device.
- The power supply of the GR2000-6H weighs 8 kg. Handle with care, since it could cause injury if it is dropped.

Specific Caution Instructions

Caution: **This is a caution notice. Follow the instructions in this notice to avoid damage to the equipment or a disruption in service.**

- Condensation may form on the surface and inside the device if it is moved from a cold to a warm location. Using the device in this condition may cause fire or electric shock. After moving the device between two locations with a large temperature variation, let the device stand for a few hours before using.
- Do not block the device's ventilation.
- Move the device carefully. Before moving the device, unplug the power cable, disconnect all exterior devices, and remove the stabilization clamps. Failure to follow this warning may damage the device or power cable, causing fire or electric shock.
- Do not hold the device by the front and back when moving; the cover may come off, causing the device to fall.
- Do not subject the device to extreme temperatures.
- Do not place the device in direct sunlight or near heat sources that may cause damage.
- A yellow label designates that a Class 1 laser is being used. Light emission is minimal and not hazardous, but avoid looking directly into the laser beam.
- Approximate weights of the GR2000 models are as follows:
  - GR2000-2S: Approx. 15 kg. (33 lbs.)
  - GR2000-4: Approx. 25 kg. (55 lbs.)
  - GR2000-4S: Approx. 21 kg. (46 lbs.)
  - GR2000-6H: Approx. 55 kg. (121 lbs.)
  - GR2000-10: Approx. 85 kg. (187 lbs.)
  - GR2000-10H: Approx. 120 kg. (264 lbs.)
  - GR2000-20: Approx. 190 kg. (418 lbs.)
  - GR2000-20H: Approx. 160 kg. (352 lbs.)

Other Instructions

Cleaning

- Clean the device only with a clean, dry cloth or use a cloth that has been dampened with water or another pH-neutral liquid and thoroughly wrung out.
- Do not use volatile organic solutions such as benzene or paint thinner, chemicals, chemically treated cloths or pesticides, which may deform, discolor or damage the device.

Storage

Unplug the power cable from the outlet when the device is not used for long periods.

Table of Contents

Chapter 1 - General Information 1-1

1.1 Purpose and Organization of This Manual 1-1

1.2 Outline of Installation Process 1-2

Chapter 2 - Product Overview 2-1

2.1 Models 2-1

2.2 Physical Appearance 2-2

2.3 Device Configuration 2-20

2.4 Device Components 2-28

2.4.1 Cabinet (Network Processor Unit Chassis) 2-29

2.4.2 Basic Control Unit (BCU) 2-29

2.4.2.1 RM-CPU 2-30

2.4.2.2 RM-IO 2-30

2.4.2.3 RMB-CPU 2-30

2.4.2.4 RMB-IO 2-30

2.4.2.5 Crossbar Switch (CSW) 2-31

2.4.3 Routing Processor Module(RP) 2-31

2.4.4 Network Interface Module (NIF) 2-34

2.4.5 Power Supply Unit (POW) 2-36

2.4.6 CPU Fan 2-36

2.4.7 Main Storage Card (MS) 2-36

2.4.8 Flash Memory Card (MC) 2-36

2.4.9 Interface Cables 2-37

2.4.10 NIF accessory (GBIC) 2-37

2.4.11 Temperature monitoring sensor 2-37

2.4.12 Software 2-38

2.5 Connections 2-40

2.5.1 Interface Cables and Connectors 2-40

2.5.1.1 LAN 2-42

2.5.1.2 WAN 2-43

2.5.1.3 ATM 2-44

2.5.2 Network Connections 2-44

2.5.2.1 LAN Connection 2-44

2.5.2.2 WAN Connection 2-45

2.5.2.3 ATM Connection 2-45

Chapter 3 - Component Details 3-1

3.1 Cabinet (Chassis)..... 3-1

3.2 Module Characteristics 3-3

3.3 Basic Control Unit (BCU)..... 3-4

3.3.1 RM-CPU(2S) 3-4

3.3.2 RMP (2S)..... 3-5

3.3.3 RM-CPU(4S), RMB-CPU (4S), RM-CPU(HH), RMB-CPU (HH), RM-CPU(MH), RMB-CPU (MH), RM-CPU(LH) and RMB-CPU (LH) 3-8

3.3.4 RM-CPU(S), RM-CPU(M), RM-CPU(MC2) and RM-CPU(L) 3-10

3.3.5 RM-IO(4S), RMB-IO (4S) and RM-IO(H)..... 3-11

3.3.6 RM-IO(S), RM-IO(M), and RM-IO(L) 3-14

3.3.7 RMB-IO(H)..... 3-15

3.3.8 CSW 3-15

3.4 Routing Processor (RP) 3-16

3.4.1 RP-A1/RP-D/RP-D6 3-16

3.4.2 RP-C/RP-C6..... 3-17

3.5 Network Interface Module (NIF) 3-18

3.5.1 NE100-8T, NE100-8TA and NE100-8TB..... 3-19

3.5.2 NE100-4F, NE100-4FS, and NE100-4FS4..... 3-20

3.5.3 NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1LB, NE1G-1SB and NE1G-1LHBA..... 3-21

3.5.4 NWVX-4..... 3-22

3.5.5 NWVX-8..... 3-25

3.5.6 NWJB-8 3-32

3.5.7 NWJ1-4U..... 3-33

3.5.8 NWMX1-4 3-34

3.5.9 NWJ1-8U..... 3-35

3.5.10 NWT1-4 3-36

3.5.11 NWE1-4 3-38

3.5.12 NWJ2-1U 3-40

3.5.13 NWT3-2U..... 3-42

3.5.14 NWE3-2U 3-44

3.5.15 NWE3-1C 3-46

3.5.16 NWOC3C-2M, NWOC3C-2S, NWOC3C-2SD and NWOC3C-2MD..... 3-48

3.5.17 NWOC3C-8S and NWOC3C-8M..... 3-50

3.5.18 NWOC12C-1S and NWOC12-1SD 3-51

3.5.19 NWOC12-4S and NWOC12-4M 3-52

3.5.20 NWOC48-1S, NWOC48-1S4 and NWOC48-1S8..... 3-53

3.5.21 NWOC48-1A, NWOC48-1A4 and NWOC48-1A8..... 3-54

3.5.22 NAOC3-1M and NAOC3-1S..... 3-56

3.5.23 NA25M-1 3-57

3.5.24 NAOC3-8S and NAOC3-8M..... 3-58

3.5.25 NAOC12-2S and NAOC12-2M 3-59

3.5.26 NE1G-4C 3-60

3.5.27 NWT3-1C 3-61
3.5.28 NWE1-8 3-63
3.6 Power Supply Unit (POW) 3-65
3.6.1 POW-S100S 3-66
3.6.2 POW-H100H 3-67
3.6.3 POW-HDCH 3-67
3.6.4 POW-M100H and POW-M100HA 3-68
3.6.5 POW-M200H and POW-M200HA 3-69
3.6.6 POW-MDCH and POW-MDCHA 3-70
3.6.7 POW-L200H and POW-L200HA 3-71
3.6.8 POW-LDCH and POW-LDCHA 3-72
3.6.9 POW-S100 3-73
3.6.10 POW-M100 and POW-L200 3-73
3.6.11 POW-MDC and POW-LDC 3-74
3.7 Memory Module (MS64, MS128 and MS256) 3-74
3.8 Memory Card Module (MC30 and MC64) 3-75
3.9 Fittings 3-75
3.9.1 AC Input Power Cord 3-75
3.9.2 WAN Loop Connector 3-76
3.9.3 V.24, V.35, and X.21 Interface Cables 3-76
3.9.3.1 V.24 Interface Cable 3-77
3.9.3.2 V.35 Interface Cable 3-82
3.9.3.3 X.21 Interface Cable 3-83
3.10 Customer-Responsibility Interface Cables 3-84
3.10.1 LAN Interface Cables 3-85
3.10.1.1 UTP Cable for 10BASE-T and 100BASE-TX 3-86
3.10.1.2 Multimode Optical Fiber Cable for 100BASE-FX, 1000BASE-SX, and 1000BASE-LX 3-87
3.10.1.3 Single-Mode Optical Fiber for 100BASE-FX, 1000BASE-LX, and 1000BASE-LH 3-88
3.10.2 WAN Interface Cables 3-89
3.10.2.1 UTP Cable for Basic (I.430 or I.430-a) 3-90
3.10.2.2 UTP Cable for Primary (I.431 or I.431-a) 3-92
3.10.2.3 UTP Cable for Primary (T1/E1) 3-93
3.10.2.4 Metal (Coaxial) Cable for Secondary (G.703) 3-94
3.10.2.5 Metal (Coaxial) Cable for Tertiary (T3/E3) 3-94
3.10.2.6 Multimode Optical Fiber Cable for OC-3c/STM-1 (POS) MMF 3-95
3.10.2.7 Single-Mode Optical Fiber Cable for OC-3c/STM-1 (POS) SMF and OC-12c/STM-4 (POS) 3-95
3.10.2.8 Single-Mode Optical Fiber Cable for OC-48c/STM-16 (POS) 3-97
3.10.2.9 Single-Mode Optical Fiber Cable 3-98
3.10.3 ATM Interface Cables 3-99
3.10.3.1 Multimode Optical Fiber Cables for OC-3c/STM-1 (ATM) MMF 3-100
3.10.3.2 Single-Mode Optical Fiber Cable for OC-3c/STM-1 (ATM) SMF 3-101
3.10.3.3 UTP Cable for 25Mbps ATM 3-102

Chapter 4 - Precautions in Planning Installation 4-1

4.1 Prerequisites 4-1
4.1.1 Local Setup Console and Remote Operation Terminal 4-1
4.1.2 Backup Flash Memory Card (MC) 4-6
4.2 Configuration Limits 4-7
4.2.1 RP 4-7
4.2.2 NIF 4-9
4.2.3 Main Memory 4-10
4.2.3.1 Memory Increments 4-10
4.2.4 Line Accommodation 4-11
4.2.4.1 Line Accommodation with 100BASE-TX 4-11
4.2.4.2 Line Accommodation with 100BASE-FX 4-12
4.2.4.3 Line Accommodation with WAN (Other than ISDN and Overload) 4-12
4.2.4.4 Line Accommodation with WAN (ISDN) 4-14
4.2.4.5 Line Accommodation with WAN (Overload) 4-14
4.2.4.6 Line Accommodation on GR2000-2S 4-16
4.2.4.7 Line Accommodation on GR2000-4S and GR2000-4 with Shared-Bus Structure 4-17
4.2.4.8 Accommodation conditions for each function in Ethernet and gigabit Ethernet 4-19
4.2.4.9 Line accommodating conditions for ATM 4-20
4.2.5 Maximum Number of Peers 4-21
4.2.5.1 Maximum Number of ARP Entries 4-21
4.2.5.2 Maximum Number of PVCs 4-21
4.2.6 Maximum Number of Interfaces and Multihome Subnets 4-22
4.2.6.1 Maximum Number of Interfaces 4-22
4.2.6.2 Maximum Number of Multihome Subnets 4-22
4.2.7 Routing Resource Accommodation Limits 4-23
4.2.7.1 Maximum Number of Neighbor Routers 4-23
4.2.7.2 Relationships between Maximum Number of Route Entries and Maximum Number of Neighbor Routers 4-23
4.2.7.3 Relationships between Maximum Number of Route Entries and Line Speed 4-24
4.2.8 IP Multicast Accommodation Limits 4-25
4.2.9 IPX and Bridge Accommodation Limits 4-26
4.2.10 Maximum Number of Dynamic Entries and Static Entries 4-26
4.2.11 MPLS/IP-VPN [ROUTE-OS3] 4-27
4.2.11.1 Applicable Device and Software 4-27
4.2.11.2 Routing Processor Modules (RP) and NIF 4-28
4.2.11.3 Memory Card Unit (MC) 4-30
4.2.11.4 Minimum Memory Requirements 4-30
4.2.11.5 Accommodating conditions for the MPLS function 4-35
4.2.11.6 MPLS policy routing function 4-38
4.2.11.7 Dynamic Entry and Static Entry Maximum Entry Count 4-38
4.2.11.8 COPS function 4-39
4.2.12 IPv6 [ROUTE-OS6] 4-39
4.2.12.1 Applied Router and Software 4-39

4.2.12.2 IPv6 function restrictions regarding the routing processing mechanism (RP) mounting conditions 4-40
4.2.12.3 Minimum Required Memory 4-41
4.2.12.4 Number of NDP Entries 4-42
4.2.12.5 Number of Interfaces 4-43
4.2.12.6 Maximum Number of Addresses to be Set in Multi-Home 4-43
4.2.12.7 Maximum Number of Tunnel Interfaces to be Set 4-44
4.2.12.8 Maximum Number of IPv6 Addresses to be Set 4-44
4.2.12.9 Routing Resource 4-45
4.2.12.10 Relation Between the Number of Route Entries and the Line Speed 4-46
4.2.12.11 Maximum Number of Dynamic and Static Entries 4-46
4.2.13 Tag-VLAN 4-47
4.2.13.1 Routing Processor Module (RP) and NIF 4-47
4.2.13.2 Number of Tag-VLANs to be Set 4-47
4.2.13.3 Number of Tag-VLANs to be Set in Multi-Home 4-48
4.2.13.4 COPS function 4-49
4.3 Segmentation/Topology Restrictions 4-50
4.3.1 Items to be Prepared 4-50
4.3.2 Network Configuration 4-50
4.4 LAN Networking Restrictions 4-51
4.4.1 10BASE-T/100BASE-TX 4-51
4.4.2 100BASE-FX 4-51
4.4.3 1000BASE-SX/1000BASE-LX/1000BASE-LH 4-51
4.4.4 Autonegotiation Connection (Applicable to 10BASE-T/100BASE-TX/1000BASE-SX/1000BASE-LX/1000BASE-LH) 4-51
4.4.5 Flow Control 4-51
4.4.6 Priority Control and Tagged Virtual LAN 4-52
4.5 WAN Networking Restrictions 4-52
4.5.1 Required Settings on GR2000 for Connecting Other Devices on PPP 4-52
4.5.2 Precautions on Frame Relay Network Connection 4-52
4.5.2.1 Multivendor Connection Using DLCI Group 4-52
4.5.2.2 Packet Format in Frame Relay Connection 4-52
4.5.2.3 Use of frping Command in Multivendor Environment 4-53
4.5.2.4 Conditions When Submitting Application Form to Frame Relay Network 4-53
4.5.2.5 Packet Length 4-53
4.5.3 Precautions on POS Network Connection 4-56
4.5.3.1 Required Setting on GR2000 for POS in Multivendor Environment 4-56
4.5.3.2 Required Setting on Cisco Systems' Router When Connecting GR2000 on POS Interface 4-56
4.5.4 Precautions on J2 Network Connection 4-56
4.5.5 Cautions regarding PRI circuit connections 4-57
4.5.6 Precautions on serial line connection 4-57
4.5.7 Precautions on InverseMax Terminal Adapter Connection 4-57
4.6 ATM Networking Restrictions 4-58
4.6.1 Bandwidth Planning Considerations 4-58

4.6.1.1 Routing Capacity of GR2000 on ATM Interface 4-58
4.6.1.2 Cellularization Overhead 4-58
4.6.1.3 Possible Loss of Link with Other Device Due to Shaping 4-59
4.6.1.4 Outbound QoS on ATM Interface 4-60
4.6.1.5 Relationship between Load on RP and QoS 4-60
4.6.1.6 Setting of VP peak cell rate 4-60
4.6.2 Required Settings for ATM Connection with Other Device 4-61
4.6.2.1 ATM Connection with Hitachi NP200 and NP220 4-61
4.6.2.2 ATM Connection with Hitachi AN1000 4-62
4.6.2.3 ATM Connection with Cisco Systems' Router 4-62
4.6.3 Connection to ATM Services 4-63
4.6.4 Function-wise Conditions for ATM Connection 4-63
4.6.4.1 ATM Connection with IPX Devices 4-63
4.6.4.2 ATM Connection with Bridge Devices 4-63
4.6.4.3 Parallel PVC 4-63
4.7 Precautions on IP Connection with Other Devices 4-64
4.7.1 Interface Address in Point-to-Point Line Connection 4-64
4.7.2 Precautions When Using RIP-1 on Frame Relay or ATM Network 4-64
4.7.3 Precautions When Using RIP-2 on Frame Relay or ATM Network 4-64
4.7.4 Precautions When Using OSPF on Frame Relay or ATM Network 4-64
4.7.5 Cautions When Using RIP-1 in Point-to-Point Circuits 4-65
4.7.6 Cautions When Using OSPF on Point-to-Point Circuits 4-65
4.7.7 Cautions When Using OSPF 4-65
4.7.7.1 Cautions Regarding the HelloInterval Default Value 4-65
4.7.7.2 Cautions Regarding the Priority Default Value 4-65
4.7.8 Cautions When Using BGP-4 4-66
4.7.8.1 Cautions Regarding NextHop Resolution 4-66
4.8 Precautions When Replacing Other Router with GR2000 4-67
4.9 Connection with IPv6 Router 4-68
4.9.1 Connection with IPv6 Router 4-68
4.9.1.1 Interface Address of Point-to-Point Type Line 4-68
4.9.1.2 Caution on BGP4+ Connection Using Point-to-Point Type Line 4-68
4.9.1.3 Caution When Changing the MTU Length of IPv6 Relay Line 4-69
4.9.1.4 Hardware relaying function in the same link 4-69
4.9.1.5 Destination IPv6 address of Ping6 and traceroute6 commands 4-71
4.9.1.6 IPv6 function that can be used at IPv6 relaying software processing 4-71
4.10 Precautions on IPX Connection 4-73
4.10.1 Configuration Settings 4-73
4.10.1.1 Setting of RIP Packet Processing 4-73
4.10.1.2 Setting of SAP Packet Processing 4-73
4.10.1.3 Handling of Non-Data Packets 4-73
4.10.1.4 Use of NetWare 4.1 4-74
4.10.1.5 IPX Connection with ISDN 4-74
4.10.1.6 Transmission Interval Settings for Dynamic RIP/SAP Packets on Pertinent Devices 4-74

4.10.2 Traffic of Periodic RIP and Periodic SAP Packets 4-74
4.10.2.1 Model Traffic of Periodic RIP Packets 4-75
4.10.2.2 Model Traffic of Periodic SAP Packets 4-75
4.10.2.3 Traffic of Periodic RIP and Periodic SAP Packets on Group-Defined Interface 4-75
4.11 Precautions on Bridge Connections 4-76
4.11.1 Protocol and Topology Restrictions 4-76
4.11.1.1 Spanning-Tree Protocol 4-76
4.11.1.2 Prohibited Topologies with Bridge Connection 4-76
4.11.2 HDLC Pass-Through and Priority Control 4-76
4.11.3 Bridge Connection over Frame Relay 4-76
4.11.3.1 Definition of Interface 4-76
4.11.3.2 Network Configuration 4-77
4.11.4 Spanning-Tree Operation on Bridge Connection over ATM 4-77
4.11.5 Bridge Definition on Group-Defined Interface 4-78
4.11.6 Bridge Definition on ISDN Interface 4-78
4.12 Precautions on QoS Control 4-79
4.12.1 Relationship Between Load on RP and QoS 4-79
4.12.2 Transmitting Inbound-QoS-Defined Packets onto ATM Interface 4-80
4.13 Caution on Use of Tag-VLAN 4-81
4.13.1 Connection with LAN Switch 4-81
4.13.1.1 VLAN type 4-81
4.13.1.2 Tag-VLAN setting 4-81
4.13.1.3 Packets That Can be Relayed 4-81
4.13.1.4 VLAN ID 4-81
4.13.2 Connection with Terminal (PC) 4-82
4.13.2.1 Tag-VLAN support 4-82
4.13.2.2 Layer 2 Relay 4-82
4.14 Precautions for using IP multicast 4-83
4.14.1 Multicast relay 4-83
4.14.1.1 Common to protocols 4-83
4.14.1.2 When using PIM-DM and PIM-SM 4-83
4.14.1.3 When using DVMRP 4-83
4.14.1.4 When using PIM-SM 4-83
4.14.2 Redundant route (route switching due to impediment) 4-84
4.14.2.1 When using PIM-DM 4-84
4.14.2.2 When using DVMRP 4-84
4.14.2.3 When using PIM-SM 4-84
4.14.3 Applicable network patterns 4-85
4.14.3.1 PIM-DM 4-85
4.14.3.2 PIM-SM 4-87
4.15 Precautions for using MPLS 4-89
4.15.1 Non-permitted mixed use of LSP allocation system for each VPN and RFC2547 bis system 4-89
4.15.2 Precautions when mutually connecting with competitor router of LDP(DU) /RFC2547

bis system 4-89
4.15.3 Difference of range of VPN ID values by software version, IP-VPN operation system 4-89
4.15.4 Difference in IP-VPN of the LSP allocation system for each VPN using software version ... 4-90
4.15.4.1 Versions prior to Ver. 05-00 4-90
4.15.4.2 Versions thereafter including Ver. 05-00 4-91
4.15.4.3 Versions prior to Ver. 05-00 4-91
4.15.4.4 Versions thereafter including Ver. 05-00 4-91
4.15.4.5 Maximum number of VPNs that can be accommodated per device 4-91

Chapter 5 - Installation Site Conditions 5-1

5.1 Environmental Requirements 5-1
5.1.1 Temperature and Humidity 5-1
5.1.2 Dust 5-2
5.1.3 Gas Causticity/Ignitable Gas 5-2
5.1.4 External Magnetic Field 5-3
5.1.5 Vibration 5-3
5.1.6 Flooring 5-4
5.1.7 Acoustic Noise 5-4
5.1.8 Other Environmentals 5-5
5.2 Power and Cooling Requirements 5-6
5.2.1 Input Power Requirements 5-6
5.2.2 Power Feeding Diagram 5-7
5.2.2.1 100V ac Input (GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H, GR2000-4, GR2000-10) 5-7
5.2.2.2 200V ac Input (GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H, GR2000-20H, GR2000-4, GR2000-10, GR2000-20) 5-8
5.2.2.3 –48V or –60V dc Input (GR2000-6H, GR2000-10H, GR2000-20H, GR2000-10, GR2000-20) 5-9
5.2.3 Power Distribution Panel and Branch Circuit Requirements 5-10
5.2.4 Receptacles for Input Power Plugs (AC Input) 5-11
5.2.5 Electrical Noise Considerations 5-12
5.2.6 Power Consumption and Heat Dissipation 5-13
5.2.7 Cooling Requirements 5-13
5.2.7.1 Airflow 5-13
5.2.7.2 Cooling Requirements for Desktop or Floor Installation 5-16
5.2.7.3 Cooling Requirements for Rack-Mount Installation 5-17
5.3 Layout 5-17

Chapter 6 - Hardware Installation 6-1

6.1 Unpacking 6-1
6.1.1 Chassis 6-1
6.1.2 RM/RP/NIF Module 6-9
6.1.3 Memory Module 6-10
6.1.4 Flash Memory Card (MC) 6-10

6.1.5 Cable 6-11
6.2 Handling of Components Subject to Static Electricity 6-11
6.3 Installation of Chassis 6-12
6.3.1 General Rules for Installation of Chassis 6-12
6.3.2 Desktop Installation of Chassis 6-13
6.3.3 Floor Installation of Chassis 6-14
6.3.3.1 Fixation of Located Router 6-17
6.3.3.2 Optional Fixation Using UNDER SUPPORT (GR2000-20 Only) 6-21
6.3.3.3 How To Move Floor-Installed Router 6-22
6.3.4 Rack-Mount Installation of Chassis 6-23
6.3.4.1 Rack-Mount Installation of Small-Scale Chassis—GR2000-2S, GR2000-4, GR2000-4S, GR2000-6H 6-23
6.3.4.2 Rack-Mount Installation of Medium-Scale Chassis—GR2000-10H and GR2000-10 6-28
6.3.4.3 Rack-Mount Installation of Large-Scale Chassis—GR2000-20H and GR2000-20 6-33
6.3.4.4 Rack mount fittings 6-37
6.4 Routing and Connection of Cables 6-40
6.4.1 General Rules for Routing and Connection of Cables 6-40
6.4.2 Connection of Input Power Cables 6-44
6.4.2.1 GR2000-2S 6-44
6.4.2.2 GR2000-4S 6-44
6.4.2.3 GR2000-6H 6-45
6.4.2.4 GR2000-10H 6-47
6.4.2.5 GR2000-20H 6-49
6.4.2.6 GR2000-4 6-52
6.4.2.7 GR2000-10 6-53
6.4.2.8 GR2000-20 6-56
6.4.3 Connection of Interface Cables 6-58
6.4.3.1 LAN: 10BASE-T and 100BASE-TX 6-58
6.4.3.2 LAN: 100BASE-FX, 1000BASE-SX, 1000BASE-LX, and 1000BASE-LH 6-59
6.4.3.3 WAN: V.24, V.35, and X.21 6-59
6.4.3.4 WAN: BRI and PRI 6-60
6.4.3.5 WAN: Secondary and Tertiary 6-60
6.4.3.6 WAN: OC-3c POS, OC-12c POS, and OC-48c POS 6-61
6.4.3.7 ATM/MMF/SMF: OC-3c ATM/MMF, OC-3c ATM/SMF, OC-12c/ATM/MMF and OC-12c ATM/SMF 6-61
6.4.3.8 ATM: 25Mbps ATM 6-62
6.5 Mounting and Unmounting of Flash Memory Card (MC) 6-62
6.5.1 Mounting of MC 6-62
6.5.2 Unmounting of MC 6-63
6.6 Handling of GBIC 6-64
6.7 Connection of Setup Console 6-65
6.7.1 Console specifications 6-66

Chapter 7 - Starting, Setting Up, and Stopping 7-1

7.1 Overview of Device Operation 7-1

7.2 Starting the Router 7-2

7.3 Restarting the Router 7-2

7.4 Setting Up Initial Configuration 7-3

7.5 Stopping the Router 7-3

Chapter 8 - Adding and Removing Components 8-1

8.1 BCU, RP, and NIF Modules 8-1

8.2 Power Supply Components 8-5

8.2.1 GR2000-4S 8-5

8.2.2 GR2000-6H 8-6

8.2.3 GR2000-10H 8-8

8.2.3.1 Input Unit (AC or DC) 8-8

8.2.3.2 DC-DC Unit 8-9

8.2.4 GR2000-20H 8-10

8.2.4.1 Input Unit (AC or DC) 8-10

8.2.4.2 DC-DC Unit 8-11

8.2.5 GR2000-4 8-12

8.2.6 GR2000-10 8-13

8.2.6.1 POW for AC Input 8-13

8.2.6.2 POW for DC Input 8-14

8.2.7 GR2000-20 8-15

8.2.7.1 POW for AC Input 8-15

8.2.7.2 POW for DC Input 8-16

8.3 Fans 8-17

8.3.1 Fan Tray for GR2000-10H 8-17

8.3.2 Fan Tray for GR2000-20H 8-18

8.3.3 CPU Fan for GR2000-4, GR2000-10, and GR2000-20 8-19

8.4 Main Memory Module 8-20

8.4.1 Addition/Removal of Main Memory Module for RM (BCU) 8-20

8.4.2 Addition/Removal of Main Memory Module for RP 8-21

8.5 Hot-Swapping of Components 8-21

8.5.1 Basic Control Unit (BCU) 8-21

8.5.1.1 Adding a BCU 8-22

8.5.1.2 Removing a BCU 8-22

8.5.2 Routing Processor (RP) 8-23

8.5.2.1 Adding an RP 8-23

8.5.2.2 Removing an RP 8-23

8.5.3 Network Interface (NIF) 8-23

8.5.3.1 Adding an NIF 8-23

8.5.3.2 Removing an NIF 8-23

8.5.3.3 Expansion of GBIC 8-23
8.5.3.4 Removal of GBIC 8-24

Chapter 9 - Software Installation and Updates 9-1

9.1 Introduction 9-1

9.2 Supplied Media and Equipment Required 9-1

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List of Figures

Chapter 1 - General Information 1-1

Outline of Installation 1-2

Chapter 2 - Product Overview 2-1

Front View of GR2000-2S (AC Input) 2-3
Rear View of GR2000-2S (AC Input) 2-3
Front View of GR2000-4S (AC Input) 2-3
Rear View of GR2000-4S (AC Input) 2-4
Front View of GR2000-6H (AC Input) 2-4
Rear View of GR2000-6H (AC Input) 2-5
Front View of GR2000-10H with AC Input 2-5
Rear View of GR2000-10H with AC Input 2-6
Front View of GR2000-10H with DC Input 2-6
Rear View of GR2000-10H with DC Input 2-7
Front View of GR2000-20H with AC Input 2-8
Rear View of GR2000-20H with AC Input 2-9
Front View of GR2000-20H with DC Input 2-10
Rear View of GR2000-20H with DC Input 2-11
Front View of GR2000-4 (AC Input) 2-12
Rear View of GR2000-4 (AC Input) 2-12
Front View of GR2000-10 with AC Input 2-13
Rear View of GR2000-10 with AC Input 2-13
Front View of GR2000-10 with DC Input 2-14
Rear View of GR2000-10 with DC Input 2-14
Front View of GR2000-20 with AC Input 2-15
Rear View of GR2000-20 with AC Input 2-16
Front View of GR2000-20 with DC Input 2-17
Rear View of GR2000-20 with DC Input 2-18
Half-Sized and Full-Sized NIF Modules 2-19
Block Diagram of GR2000-2S 2-21
Block Diagram of GR2000-4S 2-21
Block Diagram of GR2000-6H, GR2000-10H and GR2000-20H 2-21
Front View of GR2000-2S 2-22
Rear View of GR2000-2S 2-22
Front View of GR2000-4S 2-23
Rear View of GR2000-4S 2-23
Front View of GR2000-6H 2-24
Rear View of GR2000-6H 2-24
Front View of GR2000-10H with AC Input 2-25
Rear View of GR2000-10H with AC Input 2-25
Front View of GR2000-20H with AC Input 2-26
Rear View of GR2000-20H with AC Input 2-27
Routing Software Block Diagram 2-39

Chapter 3 - Component Details 3-1

Minimum Service Clearance for Desktop or Floor Installation 3-2
Minimum Service Clearance for Rack-Mount Installation (Top View) 3-2
Full-Size Module 3-3

Half-Size Module 3-3
RM-CPU(2S) Front Panel View 3-4
RMP Front Panel View 3-5
RM-CPU(4S), RMB-CPU (4S) Front Panel View 3-8
RM-CPU(HH) RMB-CPU (HH) Front Panel View 3-8
RM-CPU(MH) RMB-CPU (MH) or RM-CPU(LH) RMB-CPU (LH) Front Panel View (GR2000-10H/20H) 3-8
RM-CPU(S) Front Panel View 3-10
RM-CPU(M), RM-CPU(MC2) and RM-CPU(L) Front Panel View 3-10
RM-IO(4S) Front Panel View 3-11
RMB-IO(4S) Front Panel View 3-11
RM-IO(H) Front Panel View 3-11
RM-IO(S) Front Panel View 3-14
RM-IO(M) and RM-IO(L) Front Panel View 3-14
RMB-IO(H) Front Panel View 3-15
CSW-L3MH Front Panel View 3-15
CSW-L1M and CSW-L3M Front Panel View 3-15
RP-A1/RP-D/RP-D6 Front Panel View 3-16
RP-C/C6 Front Panel View 3-17
NE100-8T, NE100-8TA and NE100-8TB Front Panel View 3-19
NE100-4F, NE100-4FS, and NE100-4FS4 Front Panel View 3-20
NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1SB, NE1G-1LB and NE1G-1LHBA Front Panel View 3-21
NWVX-4 Front Panel View 3-22
NWVX-8 Front Panel View 3-25
Relationship between connection of cables supplied with VX-8 and LINE number 3-27
Line numbers for the cables attached to NWVX-8 3-28
Precautions when using the cables attached to VX-8 3-28
Precautions when using the supplied cable for NWVX-8 3-29
Size of 50-pin half-pitch connector for NWVX-8 3-29
NWJB-8 Front Panel View 3-32
NWJ1-4U Front Panel View 3-33
NWMX1-4 Front Panel View 3-34
NWJ1-8U Front Panel View 3-35
NWT1-4 Front Panel View 3-36
NWE1-4 Front Panel View 3-38
NWJ2-1U Front Panel View 3-40
NWT3-2U Front Panel View 3-42
NWE3-2U Front Panel View 3-44
NWE3-1C Front Panel View 3-46
NWOC3C-2M, NWOC3C-2S, NWOC3C-2SD and NWOC3C-2MD Front Panel View 3-48
NWOC3C-8S and NWOC3C-8M Front Panel View 3-50
NWOC12C-1S and NWOC12-1SD Front Panel View 3-51
NWOC12-4S and NWOC12-4M Front Panel View 3-52
NWOC48-1S, NWOC48-1S4 and NWOC48-1S8 Front Panel View 3-53
NWOC48-1A, NWOC48-1A4 and NWOC48-1A8 Front Panel View 3-54
NAOC3-1M and NAOC3-1S Front Panel View 3-56
NA25M-1 Front Panel View 3-57
NAOC3-8S and NAOC3-8M Front Panel View 3-58
NAOC12-2S and NAOC12-2M Front Panel View 3-59
NE1G-4C Front Panel View 3-60
NWT3-1C Front Panel View 3-61
NWE1-8 Front Panel View 3-63
Power Unit of POW-S100S 3-66
Power Unit of POW-H100H 3-67
Power Unit of POW-HDCH 3-67

AC Input Unit and DC-DC Power Unit of POW-M100H and POW-M100HA 3-68
AC Input Unit and DC-DC Power Unit of POW-M200H and POW-M200HA 3-69
DC Input Unit and DC-DC Power Unit of POW-MDCH and POW-MDCHA 3-70
AC Input Unit and DC-DC Power Unit of POW-L200H and POW-L200HA 3-71
DC Input Unit and DC-DC Power Unit of POW-LDCH and POW-LDCHA 3-72
Power Unit of POW-S100 3-73
Power Unit of POW-M100 and POW-L100 3-73
DC Power Unit of POW-MDC and POW-LDC 3-74
MS64 and MS128 Memory Module 3-74
MC30 and MC64 Flash Memory Card Module 3-75
AC Input Power Cord 3-75
WAN Loop Connector 3-76
V.24/V.35/X.21 Interface Cable Connections 3-76
V.24 Interface Cable Appearance 3-77
V.24 Interface Cable Specifications 3-77
Relationship between connection of cables supplied with VX-8 and LINE number 3-79
Line numbers for the cables attached to NWVX-8 3-80
Precautions when using the cables attached to VX-8 3-80
Precautions when using the supplied cable for NWVX-8 3-81
Size of 50-pin half-pitch connector for NWVX-8 3-81
V.35 Interface Cable Appearance 3-82
V.35 Interface Cable Specifications 3-82
X.21 Interface Cable Appearance 3-83
X.21 Interface Cable Specifications 3-83
LAN Interface Cable Connections 3-85
UTP Cable Specifications for 10BASE-T and 100BASE-TX 3-86
Multimode Optical Fiber Cable Specifications for 100BASE-FX, 1000BASE-SX, and 1000BASE-LX 3-87
Single-Mode Optical Fiber Cable Specifications for 100BASE-FX, 1000BASE-LX, and 1000BASE-LH 3-88
Customer Responsibility WAN Interface Cable Connections 3-89
UTP Cable Specifications for Basic (I.430 or I.430-a) 3-90
Connection with Basic (I.430 or I.430-a) 3-91
Connection to Device without Terminator 3-92
UTP Cable Specifications for Primary (I.431 or I.431-a) 3-92
Sample Indirect Connection with Primary (I.431 or I.431-a) 3-93
UTP Cable for Primary (G.703 or ANSI T1.403) 3-93
Metal (Coaxial) Cable for Secondary (G.703) 3-94
Metal (Coaxial) Cable for Tertiary (T3/E3) 3-94
Construction of duel shield type coaxial cable 3-95
Multimode Optical Fiber Cable Specifications for OC-3c/STM-1 (POS) MMF 3-95
Single-Mode Optical Fiber Cable Specifications for OC-3c/STM-1 (POS) SMF and OC-12c/STM-4 (POS) 3-96
Single-Mode Optical Fiber Cable Specifications for OC-48c/STM-16 (POS) 3-97
Single mode Optical Fiber Cable Specifications for NWOC48-1S8/1A8 3-98
ATM Interface Cable Connections 3-99
Multimode Optical Fiber Cable Specifications for OC-3c/STM-1 (ATM) MMF 3-100
Single-Mode Optical Fiber Cable Specifications for OC-3c/STM-1 (ATM) SMF 3-101
UTP Cable Specifications for 25Mbps ATM 3-102

Chapter 4 - Precautions in Planning Installation 4-1

Prerequisite Console/Terminals 4-1
Configuration of Inter-RP and Intra-RP Overload Processing 4-14
Shared Structure of GR2000-2S 4-16
Shared-Bus Structure of GR2000-4S and GR2000-4 4-17

Half-Size NIF Installation Examples 4-18
Example of No. of multicast group 4-25
MPLS Backbone and Access Circuits 4-28
Clock closed-loop prohibition 4-56
Conversion from Ethernet Frame to ATM Cells 4-58
Shaping at Overload 4-59
Next_Hop resolution 4-66
Network Configuration Requiring noinstall for aggregate Definition 4-67
Example for Specifying a nexthopself Parameter 4-69
Configuration to use the device for communication between IPv6 terminals on the same link ... 4-70
Configuration to become object of ICMPv6 re-direct message transmission 4-70
Typical Frame Relay Network with Bridge Connection 4-77
BPDU Frame Format Supported 4-77
Normal QoS Operation 4-79
Failing QoS Operation with Heavy Load on RP 4-80
Failing QoS on ATM Interface (Transmitting Inbound-QoS-Defined Packets onto ATM Interface) 4-80
Network Configuration 4-82
Network patterns applicable to PIM-DM and PIM-SM 4-85
Inapplicable network pattern in PIM-DM 4-86
Applicable PIM-SM network pattern 4-87

Chapter 5 - Installation Site Conditions 5-1

Process of Falling-Dust Measurement 5-2
Main Power Line Examples 5-3
Standard (Non-Redundant) Power Feeding with 100V ac Input 5-7
Redundant Power Feeding with 100V ac Input 5-7
Standard (Non-Redundant) Power Feeding with 200V ac Input 5-8
Redundant Power Feeding with 200V ac Input 5-8
Standard (Non-Redundant) Power Feeding with –48V or –60V dc Input 5-9
Redundant Power Feeding with –48V or –60V dc Input 5-9
Airflow of GR2000-2S 5-13
Airflow of GR2000-10H 5-14
Airflow of GR2000-20H 5-14
Airflow of GR2000-4 5-15
Airflow of GR2000-10 5-15
Airflow of GR2000-20 5-16

Chapter 6 - Hardware Installation 6-1

Unpacking of GR2000-2S 6-1
Unpacking of GR2000-4S 6-2
Unpacking of GR2000-6H 6-3
Unpacking of GR2000-10H 6-4
Unpacking of GR2000-20H 6-5
Unpacking of GR2000-4 6-6
Unpacking of GR2000-10 6-7
Unpacking of GR2000-20 6-8
Unpacking of Separately Shipped RM/RP/NIF Full Size Board 6-9
Unpacking of Separately Shipped NIF Half Size Board 6-9
Unpacking of Separately Shipped Memory Module 6-10
Unpacking of Flash Memory Card (MC) 6-10
Unpacking of Separately Shipped Cable 6-11
Sample Handling of Module on Anti-Static Surface 6-11

Desktop Installation for GR2000-2S and GR2000-4 6-13
Desktop Installation for GR2000-4S 6-13
Desktop Installation for GR2000-6H 6-14
GR2000-10H Floor Installation 6-14
GR2000-20H Floor Installation 6-15
GR2000-10 Floor Installation 6-15
GR2000-20 Floor Installation 6-16
GR2000-10H and GR2000-20H Screw Jack and Caster Positions 6-18
GR2000-10 Screw Jack and Caster Positions 6-19
GR2000-20 Screw Jack and Caster Positions 6-20
Fixation of GR2000-20 with Under Support 6-21
How To Move Floor-Installed Router 6-22
GR2000-2S Rack-Mount Installation 6-24
GR2000-4S Rack-mount Installation 6-25
GR2000-6H Rack-mount Installation 6-26
GR2000-4 Rack-Mount Installation 6-27
GR2000-10H Rack-Mount Installation 6-29
GR2000-10 Rack-Mount Installation 6-30
Use of Hand Lift in Rack-Mount Installation of GR2000-10H and GR2000-10 6-31
Alternative Mounting of GR2000-10 onto Rack by Hand 6-32
GR2000-20H Rack-Mount Installation 6-34
GR2000-20 Rack-Mount Installation 6-35
GR2000-20H Dimensions with Metal Brackets 6-36
GR2000-20 Dimensions with Metal Brackets 6-37
Use of Hand Lift in Rack-Mount Installation of GR2000-20H and GR2000-20 6-39
Prohibited vs. Preferred Cable Routing on Floor-Installed GR2000 6-41
Prohibited vs. Preferred Cable Routing on Rack-Mounted GR2000 6-41
Fixation of Cables on Large-Scale Models Using Metal Fittings (GR2000-20) 6-42
Fixation of Cables on Large-Scale Models Using Metal Fittings (GR2000-6H) 6-42
Fixation of Cables on Large-Scale Models Using Metal Fittings (GR2000-10H) 6-43
Fixation of Cables on Large-Scale Models Using Metal Fittings (GR2000-20H) 6-43
Connection of AC Input Power Cable to GR2000-2S 6-44
Connection of AC Input Power Cable to GR2000-10H 6-47
Connection of DC Input Power Cable to GR2000-10H 6-48
Terminal Board/Wire Dimensions for DC Input to GR2000-10H 6-49
Connection of AC Input Power Cable to GR2000-20H 6-50
Terminal Board/Wire Dimensions for AC Input to GR2000-20H 6-50
Connection of DC Input Power Cable to GR2000-20H 6-51
Terminal Board/Wire Dimensions for DC Input to GR2000-20H 6-52
Connection of AC Input Power Cable to GR2000-4 6-52
Connection of AC Input Power Cable to GR2000-10 6-53
Connection of DC Input Power Cable to GR2000-10 6-55
Terminal Board/Wire Dimensions for DC Input to GR2000-10 6-55
Connection of AC Input Power Cable to GR2000-20 6-56
Connection of DC Input Power Cable to GR2000-20 6-57
Terminal Board/Wire Dimensions for DC Input to GR2000-20 6-58
Connection of 10BASE-T or 100BASE-TX Cable Connector (RJ-45) 6-58
Connection of 100BASE-FX, 1000BASE-SX, 1000BASE-LX, or 1000BASE-LH Cable Connector (SC 2-core) 6-59
Connection of V.24, V.35, or X.21 Cable Connector (50-pin Half-Pitch) 6-59
Connection of BRI or PRI Cable Connector (RJ-45, IS8877, or RJ-48) 6-60
Connection of BRI or PRI Cable Connector (RJ-45, IS8877, or RJ-48) 6-60
Connection of OC-3c POS, OC-12c POS, or OC-48c POS Cable Connector (SC 2-core) 6-61
Connection of OC-3c ATM Cable Connector (SC 2-core) 6-61
Connection of 25Mbps ATM Cable Connector (RJ-45) 6-62
Mounting of MC 6-62

Unmounting of MC 6-63
Connection of Setup Console 6-65

Chapter 7 - Starting, Setting Up, and Stopping 7-1

Sequence of Device Operation 7-1

Chapter 8 - Adding and Removing Components 8-1

Addition/Removal of Full-Size and Half-Size Modules 8-2
Addition/Removal of Full-Size and Half-Size Dummy Panels 8-3
Addition/Removal of Guide Rail 8-4
Addition/Removal of Input Unit (AC or DC) for GR2000-10H 8-8
Addition/Removal of DC-DC Unit for GR2000-10H 8-9
Addition/Removal of Input Unit (AC or DC) for GR2000-20H 8-10
Addition/Removal of DC-DC Unit for GR2000-20H 8-11
Removal of POW for GR2000-4 8-12
Addition/Removal of POW for AC Input on GR2000-10 8-13
Addition/Removal of POW for DC Input on GR2000-10 8-14
Addition/Removal of POW for AC Input on GR2000-20 8-15
Addition/Removal of POW for DC Input on GR2000-20 8-16
Addition/Removal of Fan Tray for GR2000-10H 8-17
Addition/Removal of Fan Tray for GR2000-20H 8-18
Addition/Removal of CPU Fan for GR2000-4, GR2000-10, and GR2000-20 8-19
Addition/Removal of Main Memory Module on RM 8-20
Addition/Removal of Main Memory Module on RP 8-21

Chapter 9 - Software Installation and Updates 9-1

List of Tables

Chapter 1 - General Information 1-1

Chapter 2 - Product Overview 2-1

Maximum Number of Device Components on Enhanced Models 2-28
Each cabinet and maximum number of modules that can be mounted Device Cabinet 2-29
Abbreviation for BCU model names and configuration of each device 2-29
RP Specifications 2-32
List of NIF Modules 2-34
PS model name for each device 2-36
GBIC type 2-37
GBIC-SX/LX/LH Physical Specifications (Purchasing overseas) 2-37
The temperature surveillance threshold value for RMB-CPU and RMB-IO board 2-38
Specifications of Interface Cables and Connectors 2-40

Chapter 3 - Component Details 3-1

Installed Dimensions, Masses, and Minimum Service Clearances 3-1
BCU Components 3-4
RMP switch and function of LED indications 3-6
Specifications of 9-pin D-sub Connector on CONSOLE (RS232C) Port 3-7
Specifications of 8-pin RJ45 Connector on 10BASE-T/100BASE-TX Port 3-7
RM-CPU switch and function of LED indications 3-9
Specifications of 9-pin D-sub Connector on AUX (RS232C) Port 3-9
RM-IO switch and function of LED indications 3-12
Specifications of 9-pin D-sub Connector on CONSOLE (RS232C) Port 3-13
Specifications of 8-pin RJ45 Connector on CONSOLE (10BASE-T/100BASE-TX) Port 3-14
BCU switch and function of LED indications 3-15
RP Models 3-16
BCU switch and function of LED indications 3-16
RP-C/RP-C6 switch and function of LED indications 3-17
NIF Models 3-18
Connector Specifications for NE100-8T, NE100-8TA and NE100-8TB 3-19
NE100-4F/NE100-4FS/NE100-4FS4 switch and function of LED indications 3-20
Connector Specifications for NE100-4F, NE100-4FS, and NE100-4FS4 3-20
NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1LB, NE1G-1SB and NE1G-1LHBA switch and function of LED indications 3-21
Connector Specifications for NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1SB, NE1G-1LB and NE1G-1LHBA 3-22
NWVX-4 switch and function of LED indications 3-22
NWVX-4 LINE LED indication 3-23
Connector Specifications for NWVX-4, Pin Assignment for V.24 3-23
Connector Specifications for NWVX-4, Pin Assignment for X.21 3-24
Connector Specifications for NWVX-4, Pin Assignment for V.35 3-24
NWVX-8 switch and function of LED indications 3-25
NEW1-8 switch and function of LED indication 3-26

Connector Specifications for NWVX-8, Pin Assignment for V.24 3-30
Connector Specifications for NWVX-8, Pin Assignment for X.21 3-31
Connector Specifications for NWVX-8, Pin Assignment for V.35 3-31
NWJB-8 switch and function of LED indications 3-32
Connector Specifications for NWJB-8 3-32
NWJ1-4U switch and function of LED indications 3-33
Connector Specifications for NWJ1-4U 3-33
WMX-1-4 switch and function of LED indications 3-34
Connector Specifications for NWMX1-4 3-34
NWJ1-8U switch and function of LED indications 3-35
Connector Specifications for NWJ1-8U 3-35
NWT1-4 switch and function of LED indications 3-36
NWT1-4 switch and function of LED indication 3-37
Connector Specifications for NWT1-4 3-37
NWE1-4 switch and function of LED indications 3-38
NWE1-4 switch and function of LED indication 3-39
Connector Specifications for NWE1-4 3-39
NW2J-1U switch and function of LED indications 3-40
NW2J-1U switch and function of LED indication 3-41
Connector Specifications for NWJ2-1U 3-41
NWT3-2U switch and function of LED indications 3-42
NWT3-2U switch and function of LED indication 3-43
Connector Specifications for NWT3-2U 3-43
NWE3-2U switch and function of LED indications 3-44
NWE3-2U switch and function of LED indication 3-45
Connector Specifications for NWE3-2U 3-45
NWE3-1C switch and function of LED indications 3-46
NWE3-1C switch and function of LED indication 3-47
Connector Specifications for NWE3-1C 3-47
NWOC3C-2S/NWOC3C-2M/NWOC3C-2SD/NWOC3C-2MD switch and function of LED indications 3-48
NWOC3C-2S/NWOC3C-2M/NWOC3C-2SD/NWOC3C-2MD switch and function of LED indication 3-49
Connector Specifications for NWOC3C-2M and NWOC3C-2S 3-49
NWOC3C-8S/NWOC3C-8M switch and function of LED indications 3-50
Connector Specifications for NWOC3C-8S and NWOC3C-8M 3-50
NWOC12C-1S/NWOC12-1SD switch and function of LED indications 3-51
Connector Specifications for NWOC12C-1S 3-51
NWOC12-4S/NWOC12-4M switch and function of LED indications 3-52
Connector Specifications for NWOC12-4S and NWOC12-4M 3-52
NWOC48-1S/NWOC48-1S4 switch and function of LED indications 3-53
Connector Specifications for NWOC48-1S, NWOC48-1S4 and NWOC48-1S8 3-54
NWOC48-1A/NWOC48-1A4/ NWOC48-1A8 switch and function of LED indications 3-54
NWOC48-1A/NWOC48-1A4/ NWOC48-1A8 switch and function of LED indication 3-55
Connector Specifications for NWOC48-1A, NWOC48-1A4 and NWOC48-1A8 3-55
NWOC3-1S/NWOC3-1M switch and function of LED indications 3-56
Connector Specifications for NAOC3-1M and NAOC3-1S 3-56
NWOC3-1S/NWOC3-1M switch and function of LED indications 3-57
Connector Specifications for NA25M-1 3-57
NWOC3-8M/-8S switch and function of LED indications 3-58
Connector Specifications for NAOC3-8S and NAOC3-8M 3-58
NWOC12-2S/NWOC12-2M switch and function of LED indications 3-59
Connector Specifications for NAOC12-2S and NAOC12-2M 3-59
NE1G-4C switch and function of LED indications 3-60
GBIC and connector specifications for NE1G-4C 3-60
NWT3-1C switch and function of LED indications 3-61

NWT3-1C switch and function of LED indication 3-62
Connector specifications for NWT3-1C 3-62
NEW1-8 switch and function of LED indications 3-63
NEW1-8 switch and function of LED indication 3-64
Connector Specification for NWE1-8 3-64
POW Models 3-65
Locations for Components of POW-M100H and POW-M100HA 3-68
Locations for Components of POW-M200H and POW-M200HA 3-69
Locations for Components of POW-MDCH and POW-MDCHA 3-70
Locations for Components of POW-L200H and POW-L200HA 3-71
Locations for Components of POW-LDCH and POW-LDCHA 3-72
V.24/V.35/X.21 Interface Cable Selection 3-76
Restrictions on cable length according to line speed 3-78
LAN Interface Cable Selection 3-85
Pin arrangement on the device side (10MBASE/100MBASE interface) 3-86
Pin arrangement on the device side (10MBASE/100MBASE interface) 3-86
Optical Interface Specifications for 100BASE-FX Multimode Connection (In this case core/clad diameter is 62.5/125 µm.) 3-87
Optical Interface Specifications for 100BASE-FX and 1000BASE-LH Single-Mode Connections 3-88
Customer Responsibility WAN Interface Cable Selection 3-90
Pin arrangement on the device side (1.430 interface) 3-91
Pin arrangement on the device side (primary group (1.431) interface) 3-92
Pin arrangement on the device side and DSU side (primary group (1.431) interface 3-94
Optical Interface Specifications for OC-48c/STM-16 (POS) Single-Mode Connections 3-97
Optical Interface Specification for NWOC48-1S8/1A8 3-98
ATM Interface Cable Selection 3-99
Specifications of Optical Interface 3-100
Specifications of Optical Interface 3-101

Chapter 4 - Precautions in Planning Installation.....4-1

The operation terminal conditions 4-2
The cross cable specifications show the connection specifications for the cross cables 4-3
Modem setting 4-3
The RP mounting conditions by each model 4-7
RP mounting conditions when using GR2000-10H and GR2000-20H in 100V AC 4-8
Applicable Types and Quantities of RPs by Router Model 4-8
Quantities of NIFs by Router Model 4-9
BCU Memory Increment by Router Model 4-11
RP Memory Increment by RP Type 4-11
100BASE-TX Line Accommodation 4-11
100BASE-FX Line Accommodation 4-12
WAN Line Accommodation per NIF at Line Speed of up to 6 Mbps 4-12
WAN Line Accommodation per RP-A1 at Line Speed of up to 6 Mbps 4-12
WAN Line Accommodation per RP-D at Line Speed of up to 6 Mbps 4-13
E3 Multiplex Line Accommodation per RP-D at Line Speed of 34 Mbps 4-13
T3 Multiplex Line Accommodation per RP-D at Line Speed of 45 Mbps 4-13
WAN (ISDN) Line Accommodation Limit 4-14
WAN (Overload) Line Accommodation Limits 4-14
Multilink Overload Line Accommodation Limit: Inter-RP, Full Duplex, 64kbps Bundled 4-15
Multilink Overload Line Accommodation Limit: Inter-RP, Half Duplex, 64kbps Bundled 4-15
Multilink Overload Line Accommodation Limit: Intra-RP, Full Duplex, 64kbps Bundled 4-15
Multilink Overload Line Accommodation Limit: Intra-RP, Half Duplex, 64kbps Bundled 4-15
Restriction on Aggregate Line Speed for GR2000-4S and GR2000-4 4-17
Speed Conversion of Full-Size NIF 4-18

Accommodation Conditions in the Same RP and Different NIF 4-19
Accommodation Conditions in the Same NIF and Different LineF 4-19
Accommodation Conditions in the Same Line 4-19
Maximum Number of VLANs 4-20
Accommodating conditions for NAOC12-2M and NAOC12-2S 4-20
Accommodating conditions when using the service category GFR for ATM 4-20
Maximum Number of ARP Entries 4-21
Maximum Number of DLCIs for Frame Relay Network 4-21
Maximum Number of VCs for ATM Network 4-22
Maximum Number of Interfaces 4-22
Maximum Number of Multihome Subnets 4-22
Maximum Number of Neighbor Routers 4-23
Relationships between Max. No. of Route Entries and Max. No. of Neighbor Routers 4-23
Relationships between Max. No. of Route Entries and Max. No. of Neighbor Peers 4-24
Relationships between Line Speed and Max. No. of Route Entries 4-24
IP Multicast Accommodation Limits 4-25
IPX Accommodation Limits 4-26
Bridge Accommodation Limits 4-26
Maximum Number of Dynamic and Static Entries 4-26
Maximum Number of Dynamic and Static Entries 4-27
Applicable Models for ROUTE-OS3 4-27
Protocol types in MPLS and non-utilizable RP types 4-28
NIF Conditions that Accommodate MPLS Backbone and Access Circuits 4-29
The minimum required BCU memory in the case of LDP (DU) mode/ RFC2547 bis system 4-31
Minimum required BCU memory amount in the case of LDP(DoD)/CR-LDP mode/LSP allocation system for each VPN 4-31
RP Minimum Required Memory 4-32
BCU Minimum Required Memory 4-33
RP Minimum Required Memory 4-35
Accommodating conditions for the MPLS intrinsic function 4-36
The relationship among BCU mounted memory amount, number of LDP sessions and number of routes (only for LDP(DU) mode) 4-37
Maximum entry number of MPLS policy 4-38
Maximum Dynamic and Static Entry Count 4-38
COPS agent accommodating conditions 4-39
IPv6 accommodating conditions, and functions provided thereby (model GR2000-2S) 4-39
IPv6 accommodating conditions, and functions provided thereby (model GR2000-4S) 4-39
IPv6 accommodating conditions, and functions provided thereby (model GR2000-6H/-10H/-20H) 4-40
BCU minimum required memory 4-41
RP minimum required memory 4-42
Number of NDP entries 4-42
Number of interfaces 4-43
Maximum Number of Addresses to be Set in Multi-Home 4-43
Number of Tunnel Interfaces 4-44
Number of IPv6 Addresses 4-44
Number of Addresses Set by Configuration Definition Information 4-45
Maximum Number of Adjacent Routers 4-45
Relation Between Number of Route Entries and Maximum Number of Adjacent Peers 4-46
Relation Between Number of Route Entries and Line Speed 4-46
Maximum Number of Dynamic and Static Entries 4-47
Conditions of NIF in which Tag-VLAN Is Accommodated 4-47
Maximum Number of Tag-VLANs to Be Set 4-48
Maximum Number of Tag-VLANs to Be Set in Multi-Home 4-48
COPS agent accommodating conditions 4-49
PPP Configuration Definition Settings Required with Specific Devices 4-52

Setting the subscribing conditions and configuration defining information of the device 4-53
Configuration Definition on GR2000 for POS in Multivendor Environment 4-56
NWJ1-8U connection restrictions 4-57
ATM Configuration Definition Settings Required with NP200 and NP220 4-61
ATM Configuration Definition Settings Required with AN1000 4-62
ATM Configuration Definition Settings Required with AN1000 4-62
Examples of devices in which the HelloInterval value and the Routerdeadinterval are different with OSPF 4-65
List of IPv6 function supports by software processing 4-72
Range of values in VPN-ID 4-90
Contents of the TLV used 4-91

Chapter 5 - Installation Site Conditions 5-1

Temperature and Humidity Requirements 5-1
Dust Requirements 5-2
Input Power Requirements—AC Input 5-6
Input Power Requirements—DC Input 5-6
Requirements for Circuit Breaker on Power Distribution Panel 5-10
Receptacle Types for AC Input 5-11
Typical Power Consumption and Heat Dissipation Figures 5-13

Chapter 6 - Hardware Installation 6-1

Allowable Style of Installation by Router Model 6-12
Console specifications 6-66

Chapter 7 - Starting, Setting Up, and Stopping 7-1

Methods for Router Restart 7-2

Chapter 8 - Adding and Removing Components 8-1

Chapter 9 - Software Installation and Updates 9-1

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Chapter 1
General Information

1.1 Purpose and Organization of This Manual

This manual provides information for the installation of the GR2000 Gigabit Router Series.

The manual is organized in the following topics:

- Chapter 1 states the purpose and organization of the manual and outlines the installation process.
- Chapter 2 provides an overview of the GR2000 series.
- Chapter 3 gives software and hardware details.
- Chapter 4 gives preparation and planning precautions for installation.
- Chapter 5 details site installation requirements.
- Chapter 6 describes hardware and cable installation.
- Chapter 7 provides starting, set up, and stopping procedures.
- Chapter 8 provides instructions for adding and removing optional hardware.
- Chapter 9 gives instructions for updating software.

1.2 Outline of Installation Process

Figure 1-1 outlines the installation process.

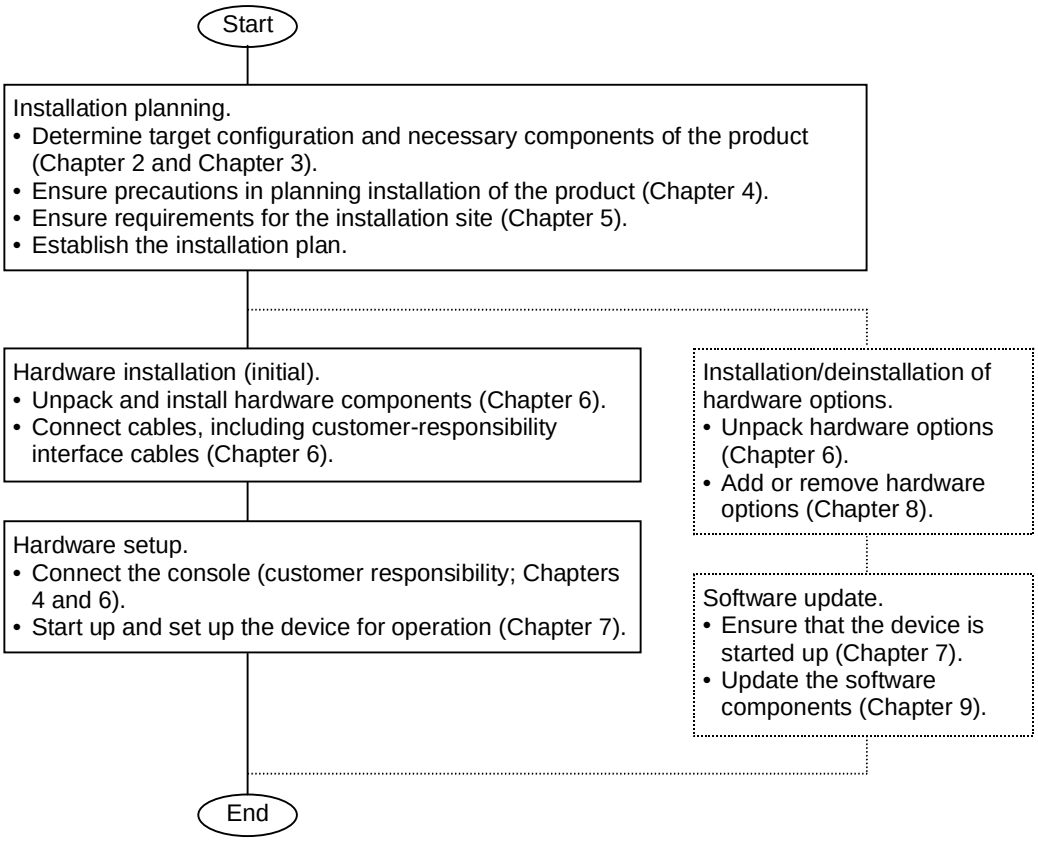

Start
Installation planning.
• Determine target configuration and necessary components of the product (Chapter 2 and Chapter 3).
• Ensure precautions in planning installation of the product (Chapter 4).
• Ensure requirements for the installation site (Chapter 5).
• Establish the installation plan.
Hardware installation (initial).
• Unpack and install hardware components (Chapter 6).
• Connect cables, including customer-responsibility interface cables (Chapter 6).
Hardware setup.
• Connect the console (customer responsibility; Chapters 4 and 6).
• Start up and set up the device for operation (Chapter 7).
Installation/deinstallation of hardware options.
• Unpack hardware options (Chapter 6).
• Add or remove hardware options (Chapter 8).
Software update.
• Ensure that the device is started up (Chapter 7).
• Update the software components (Chapter 9).
End

Figure 1-1 Outline of Installation

Chapter 2
Product Overview

2.1 Models

The GR2000 provides eight models. Models GR2000-2S, GR2000-4S, GR2000-6H, and GR2000-10H are new, enhanced models. The following are descriptions of each model:

- GR2000-2S, has two interface slots. It is the entry model for enterprise and WAN aggregation applications.
- GR2000-4S, with four interface slots, is the basic model enterprise and WAN aggregation applications.
- GR2000-6H has six interface slots and is the lower mid-range model for carrier/ ISP edge aggregation applications.
- GR2000-10H, has ten interface slots and is the mid-range model for carrier/ISP edge aggregation applications.
- GR2000-20H, with twenty interface slots, is a high end model for carrier/ISP backbone applications.
- GR2000-4, with four interface slots, is the basic model for enterprise and WAN aggregation applications.
- GR2000-10, with ten interface slots, is the mid-range model for carrier/ISP edge aggregation applications.
- GR2000-20, with twenty interface slots, is for carrier/ISP backbone applications.

2.2 Physical Appearance

The following figures show the front and rear views of the GR2000 Gigabit Router Series models. Refer to 2.3 for information about the components in these figures.

- Figure 2-1: front view of GR2000-2S (AC input)
- Figure 2-2: rear view of GR2000-2S (AC input)
- Figure 2-3: front view of GR2000-4S (AC input)
- Figure 2-4: rear view of GR2000-4S (AC input)
- Figure 2-5: front view of GR2000-6H (AC input)
- Figure 2-6: rear view of GR2000-6H (AC input)
- Figure 2-7: front view of GR2000-10H with AC input
- Figure 2-8: rear view of GR2000-10H with AC input
- Figure 2-9: front view of GR2000-10H with DC input
- Figure 2-10: rear view of GR2000-10H with DC input
- Figure 2-11: front view of GR2000-20H with AC input
- Figure 2-12: rear view of GR2000-20H with AC input
- Figure 2-13: front view of GR2000-20H with DC input
- Figure 2-14: rear view of GR2000-20H with DC input
- Figure 2-15: front view of GR2000-4 (AC input)
- Figure 2-16: rear view of GR2000-4 (AC input)
- Figure 2-17: front view of GR2000-10 with AC input
- Figure 2-18: rear view of GR2000-10 with AC input
- Figure 2-19: front view of GR2000-10 with DC input
- Figure 2-20: rear view of GR2000-10 with DC input
- Figure 2-21: front view of GR2000-20 with AC input
- Figure 2-22: rear view of GR2000-20 with AC input
- Figure 2-23: front view of GR2000-20 with DC input
- Figure 2-24: rear view of GR2000-20 with DC input

The above figures show half-size Network Interface (NIF) boards installed. GR2000 Gigabit Router Series models also supports full-sized NIF boards. Figure 2-25 shows an example of full-sized NIF boards installed (GR2000-10 with AC input).

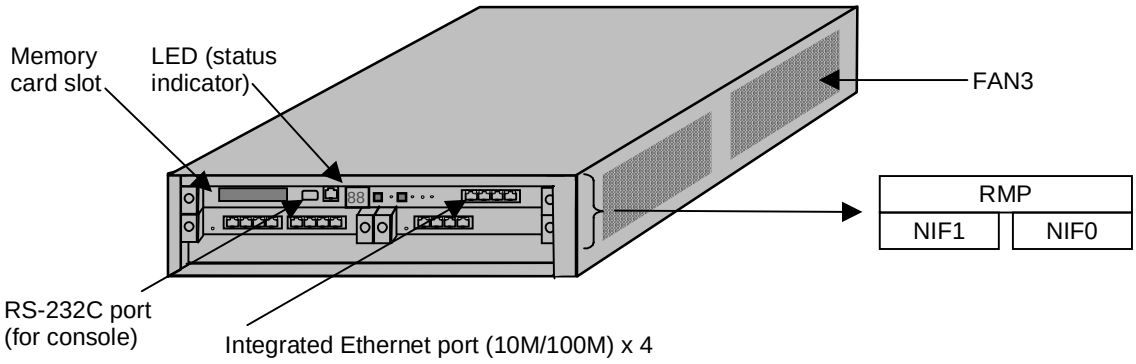


Figure 2-1 Front View of GR2000-2S (AC Input)

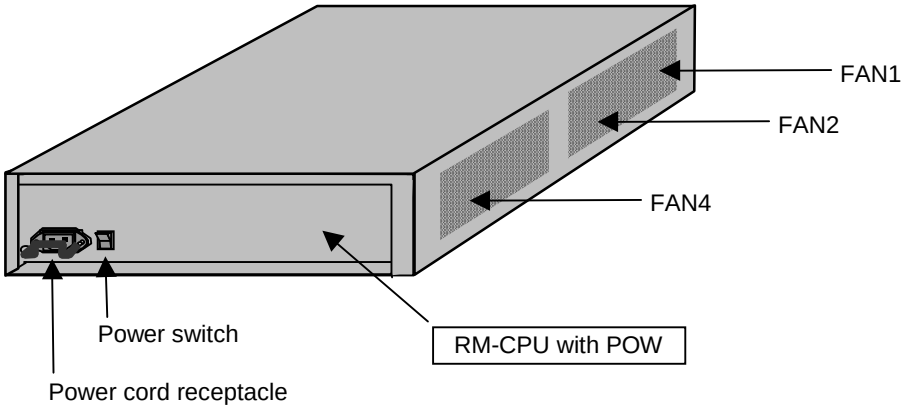


Figure 2-2 Rear View of GR2000-2S (AC Input)

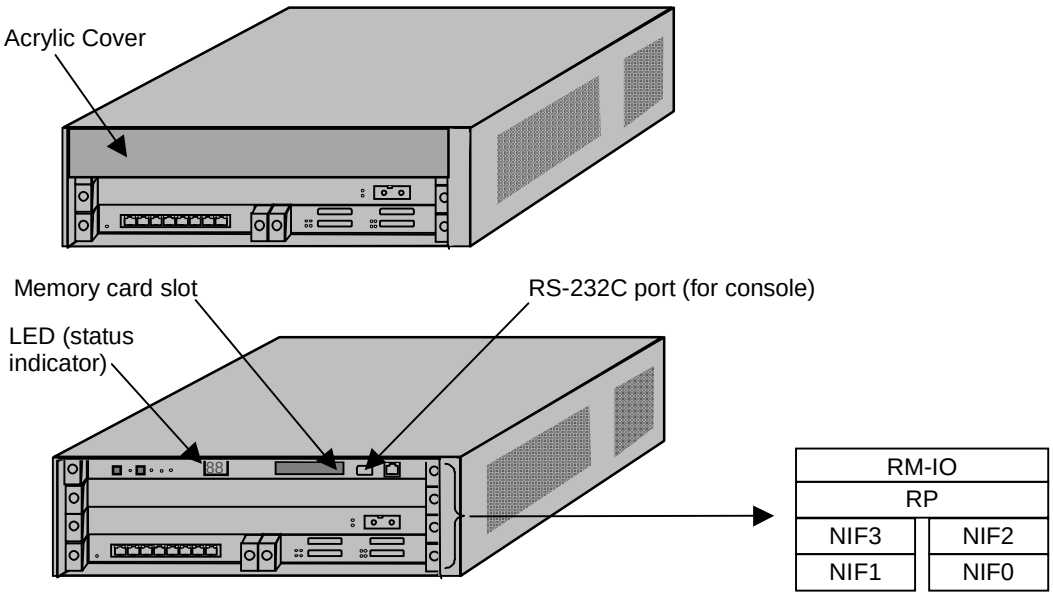


Figure 2-3 Front View of GR2000-4S (AC Input)

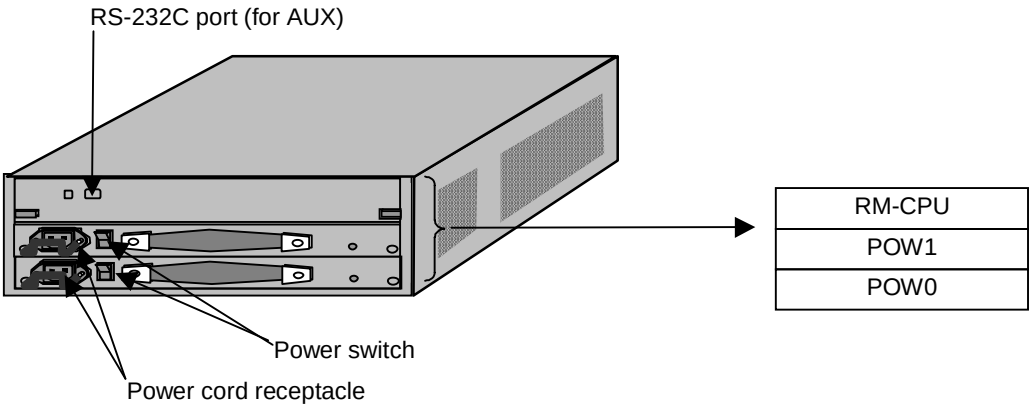


Figure 2-4 Rear View of GR2000-4S (AC Input)

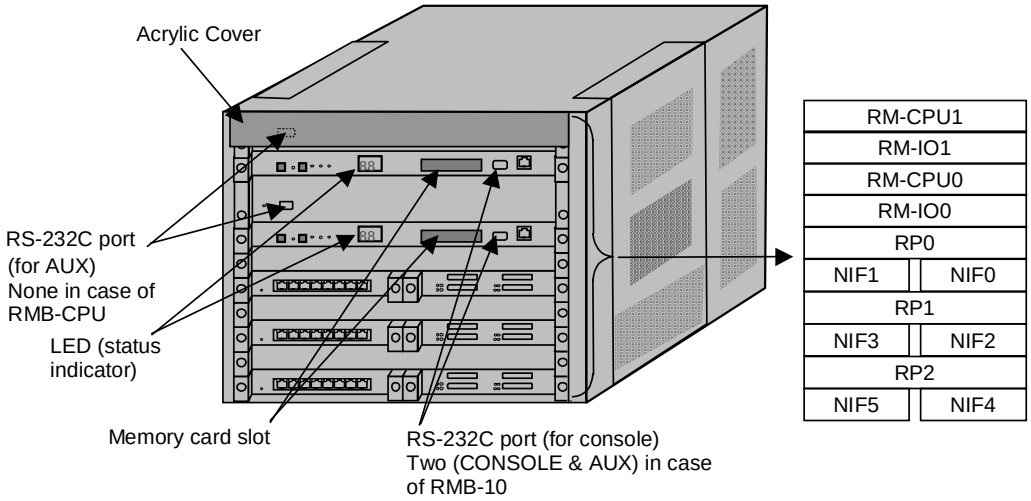


Figure 2-5 Front View of GR2000-6H (AC Input)

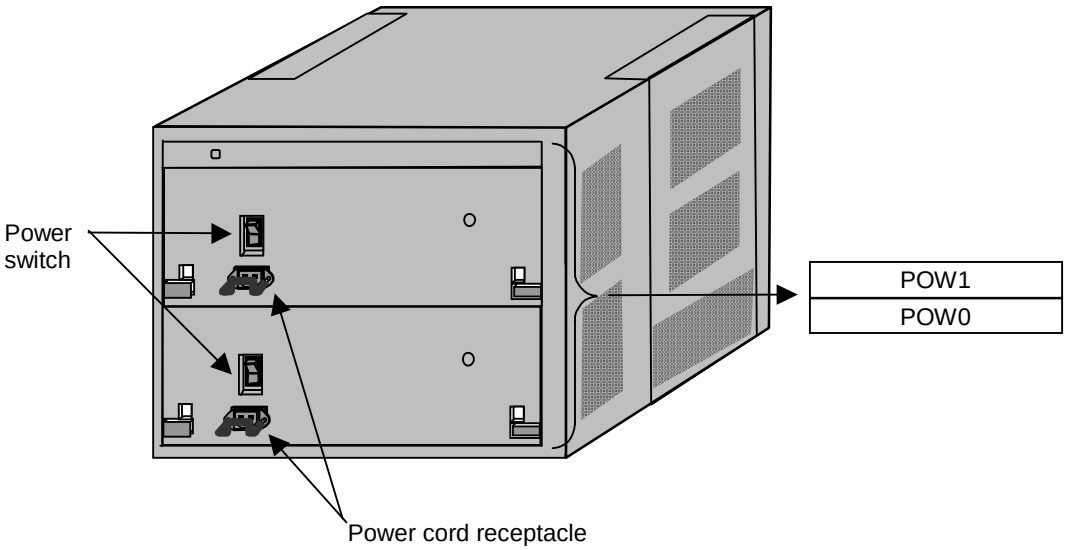


Figure 2-6 Rear View of GR2000-6H (AC Input)

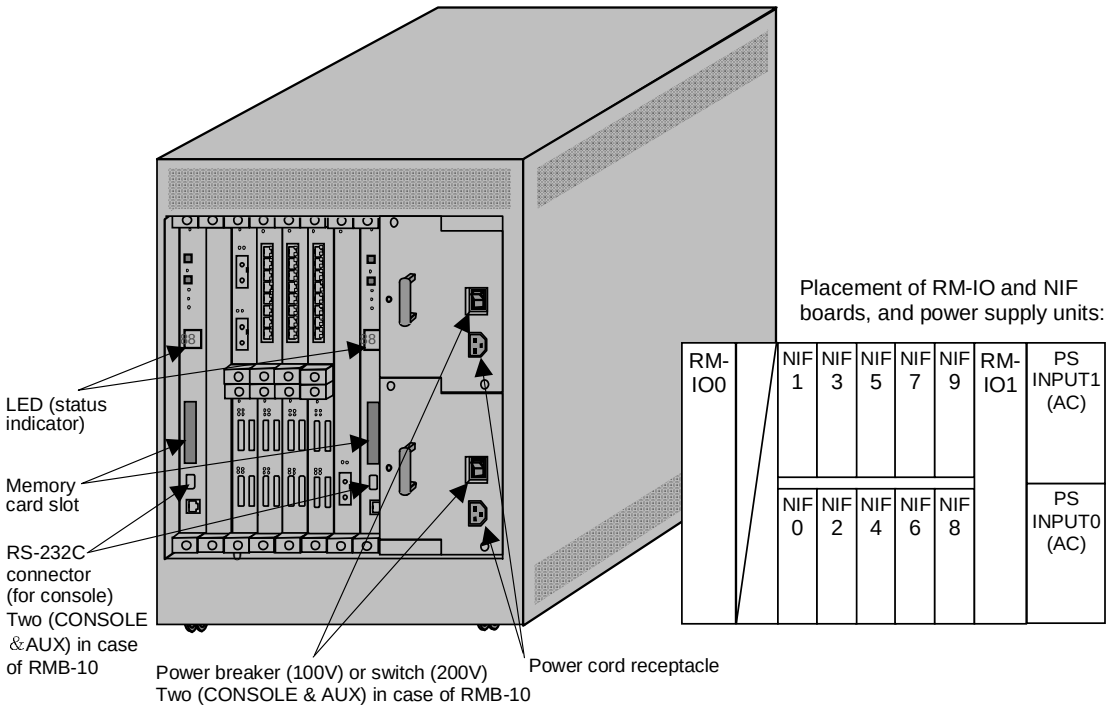


Figure 2-7 Front View of GR2000-10H with AC Input

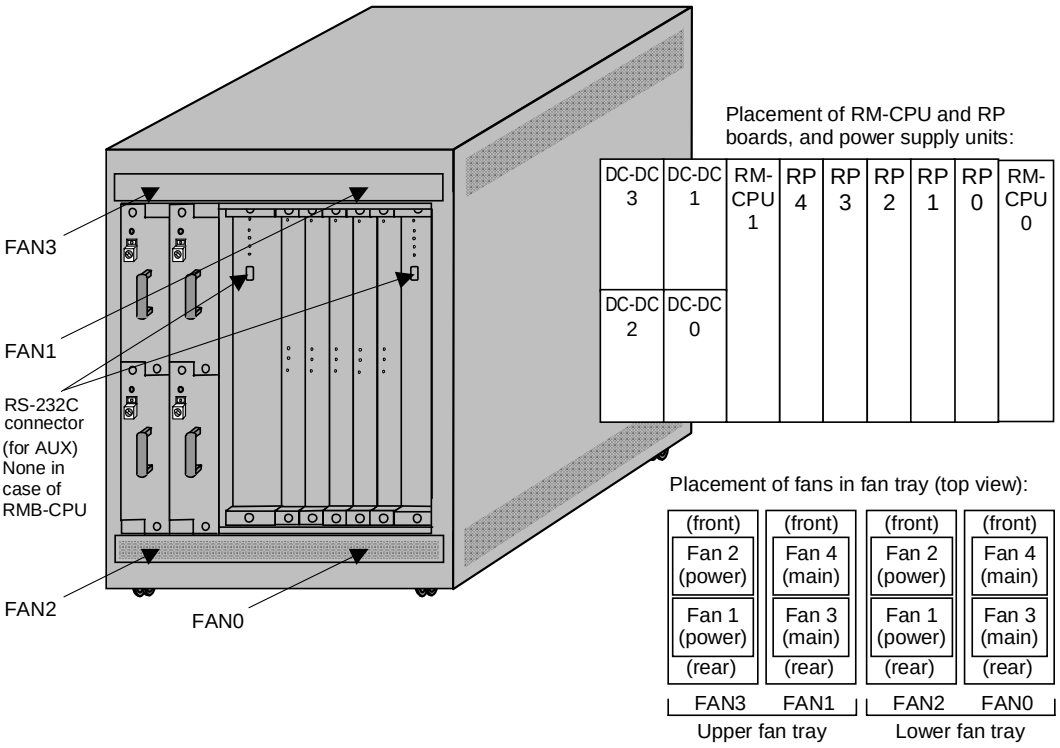


Figure 2-8 Rear View of GR2000-10H with AC Input

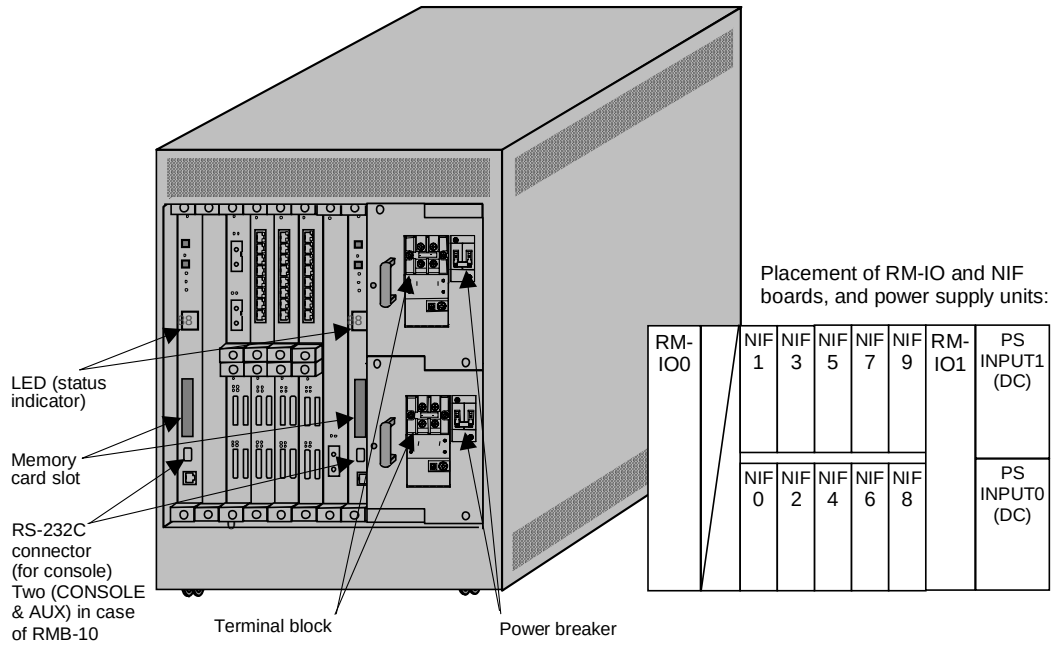


Figure 2-9 Front View of GR2000-10H with DC Input

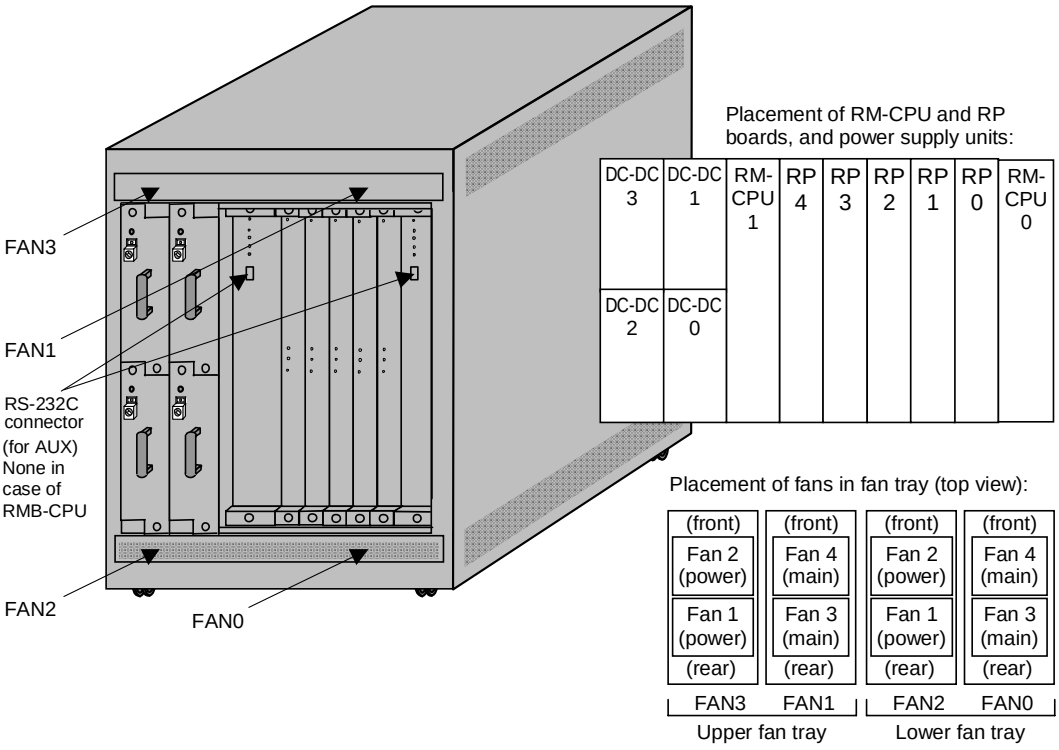


Figure 2-10 Rear View of GR2000-10H with DC Input

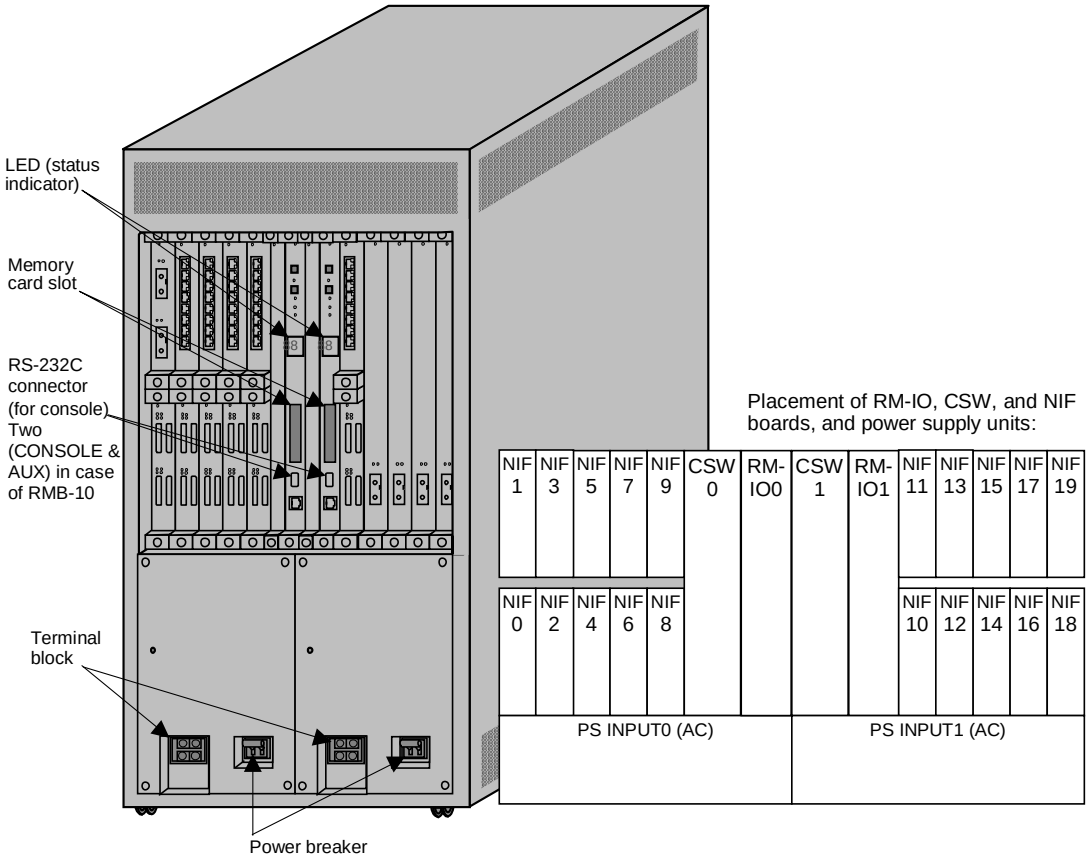


Figure 2-11 Front View of GR2000-20H with AC Input

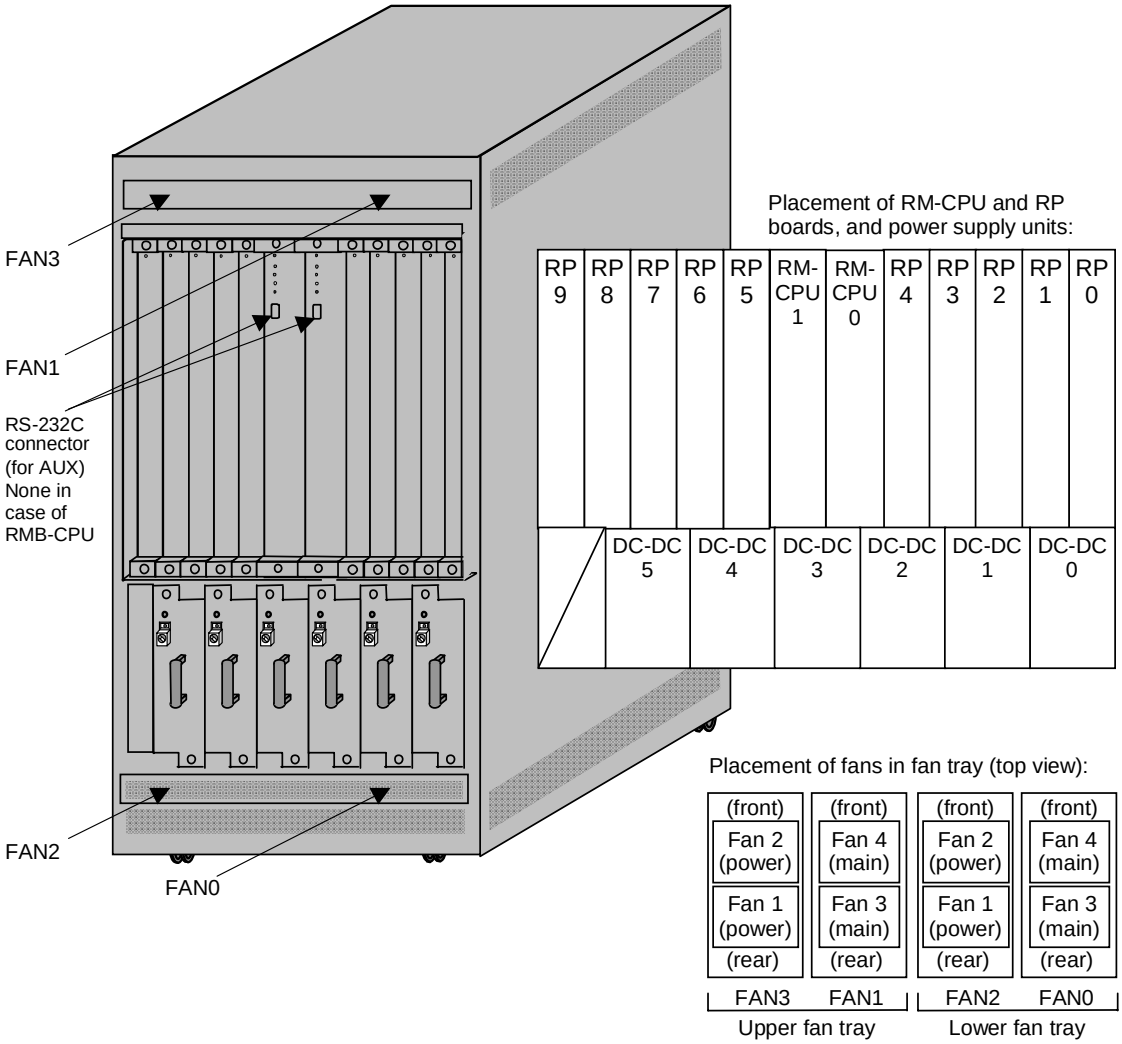


Figure 2-12 Rear View of GR2000-20H with AC Input

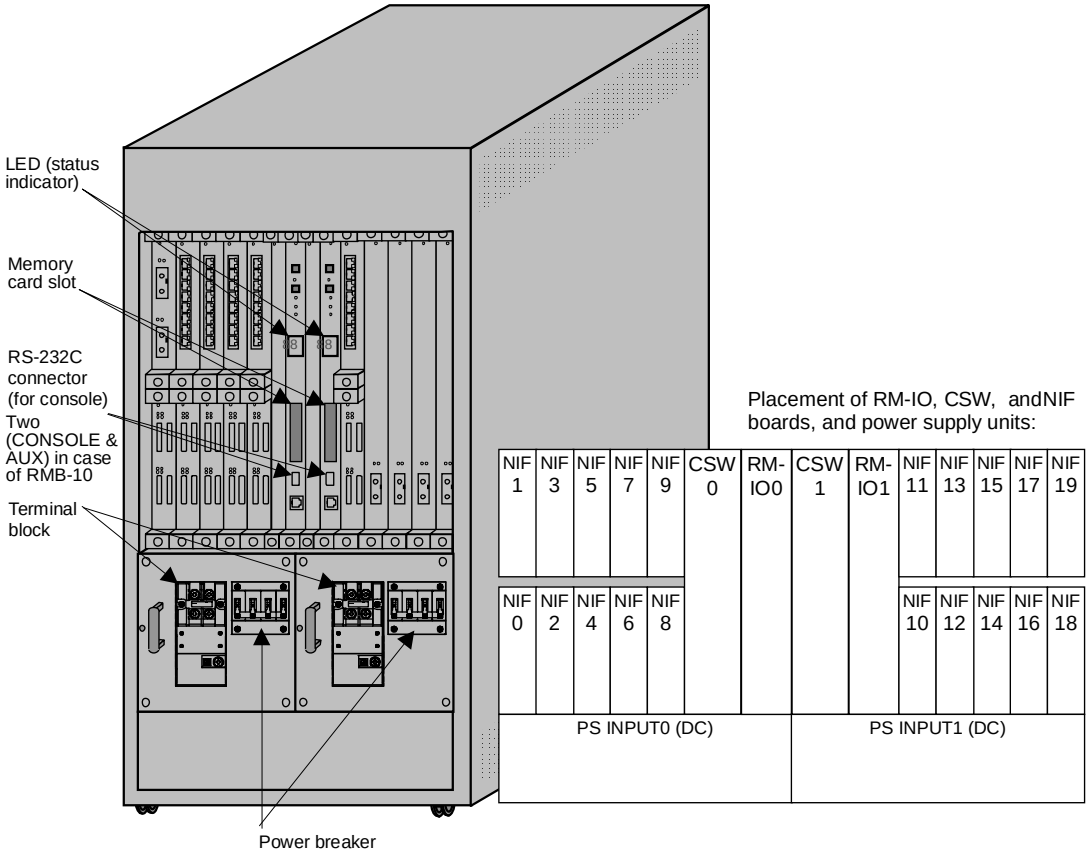


Figure 2-13 Front View of GR2000-20H with DC Input

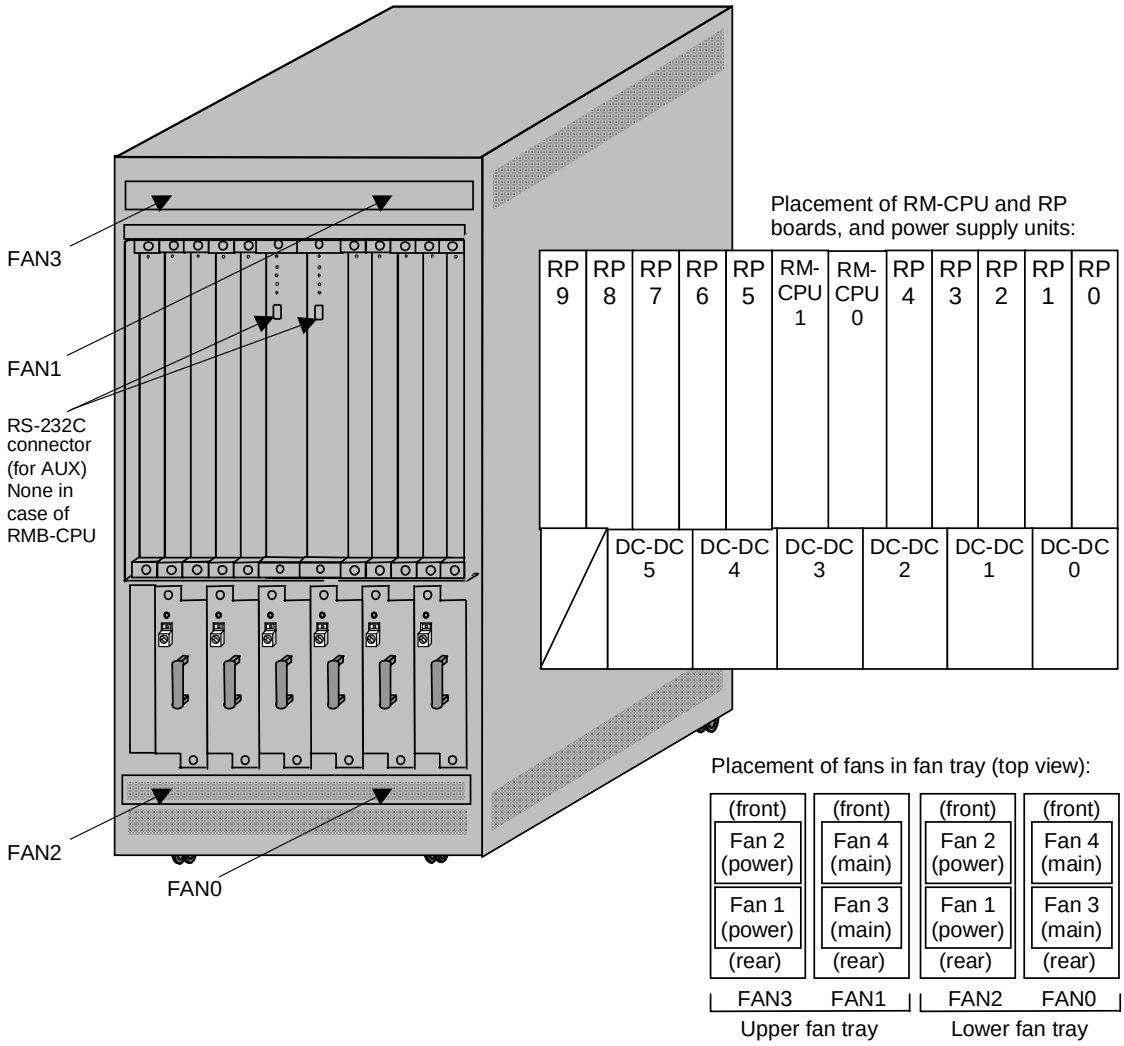


Figure 2-14 Rear View of GR2000-20H with DC Input

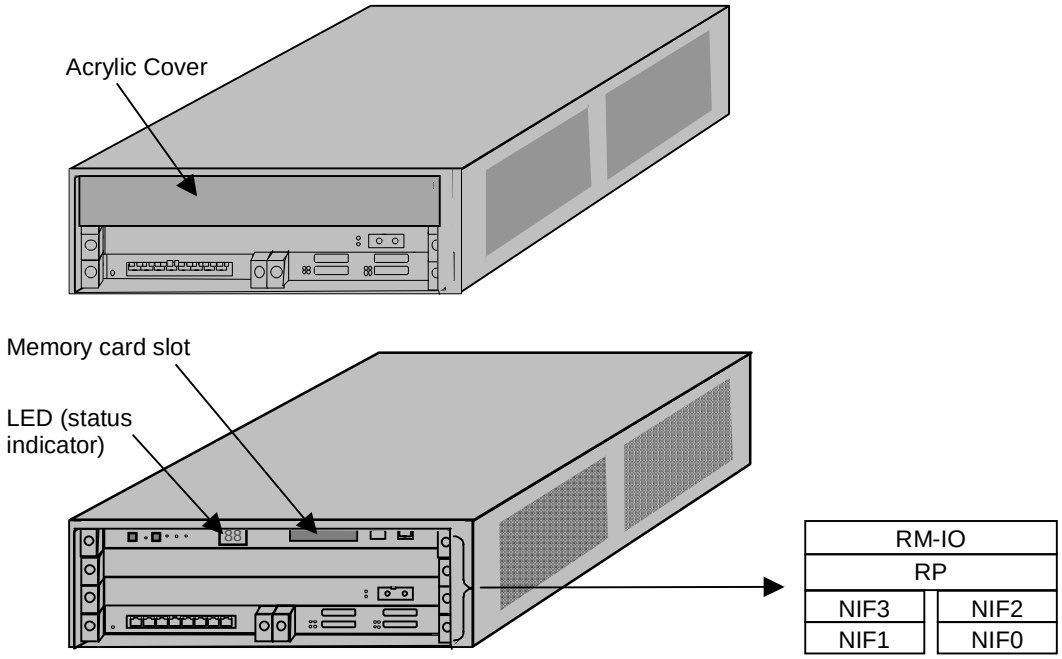


Figure 2-15 Front View of GR2000-4 (AC Input)

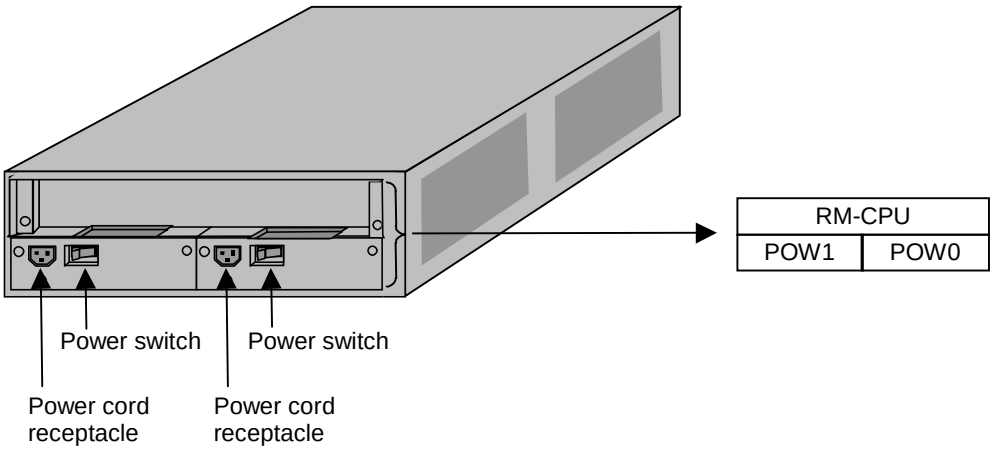


Figure 2-16 Rear View of GR2000-4 (AC Input)

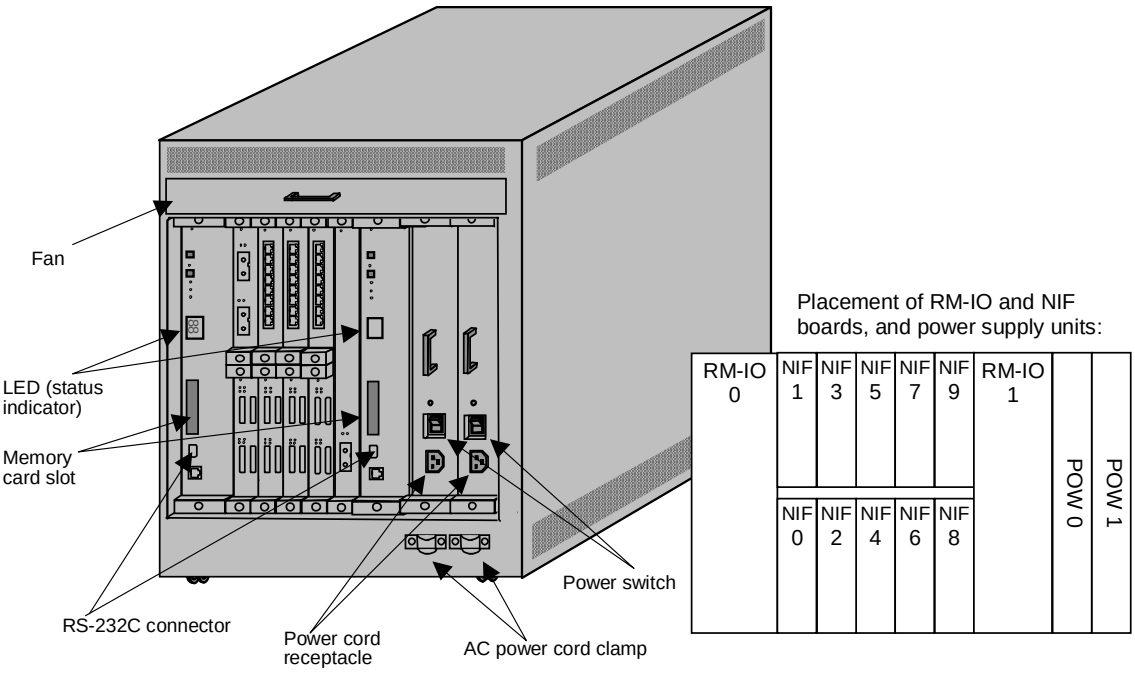


Figure 2-17 Front View of GR2000-10 with AC Input

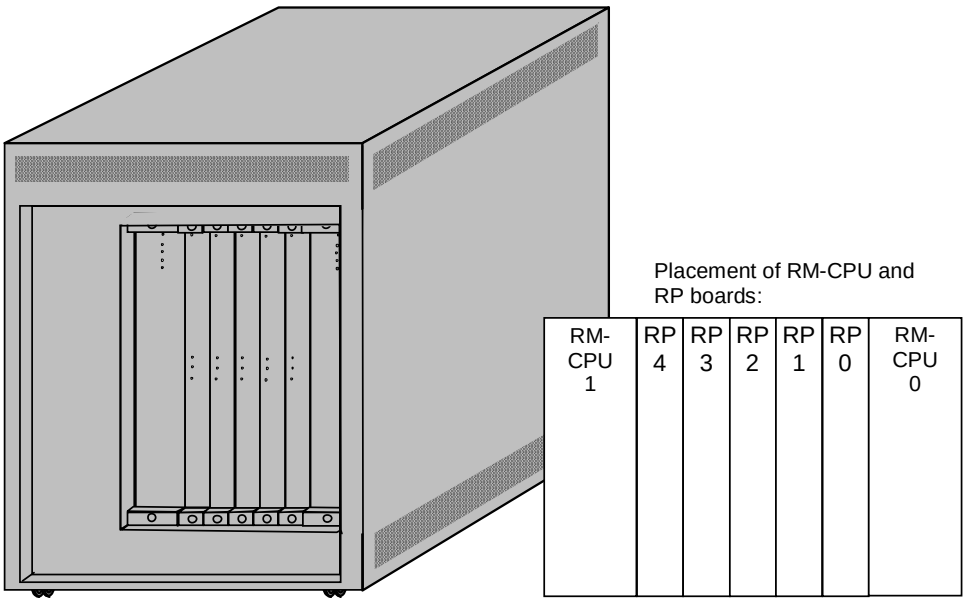


Figure 2-18 Rear View of GR2000-10 with AC Input

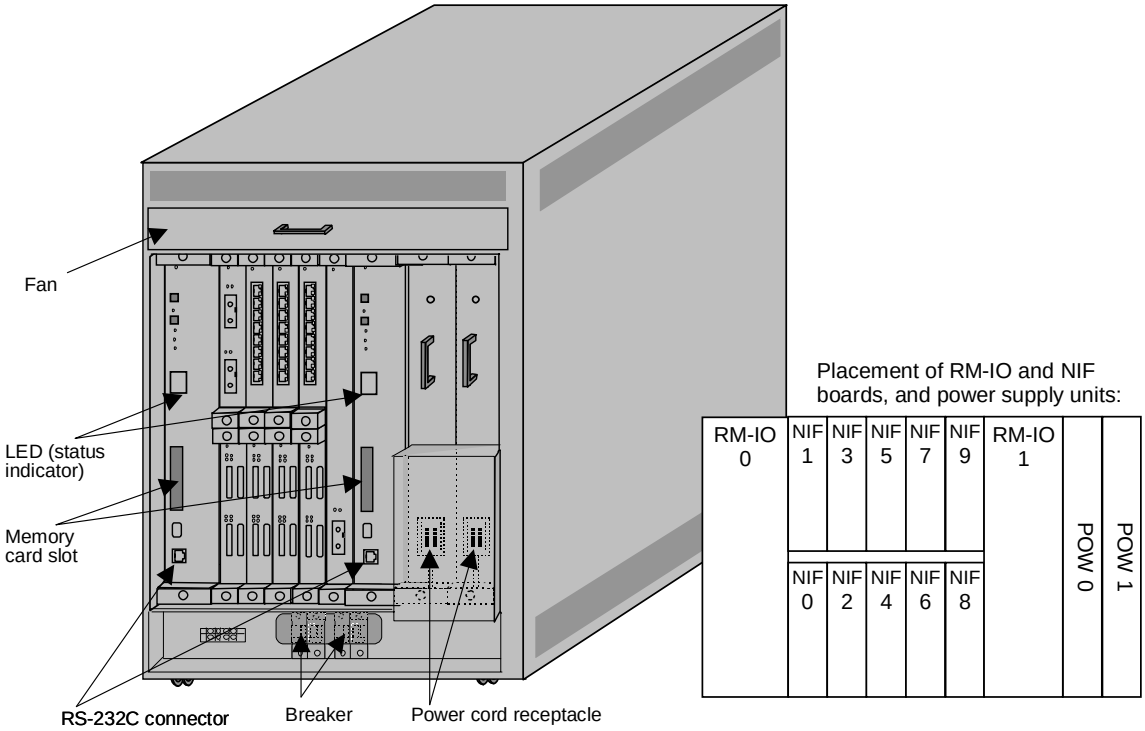


Figure 2-19 Front View of GR2000-10 with DC Input

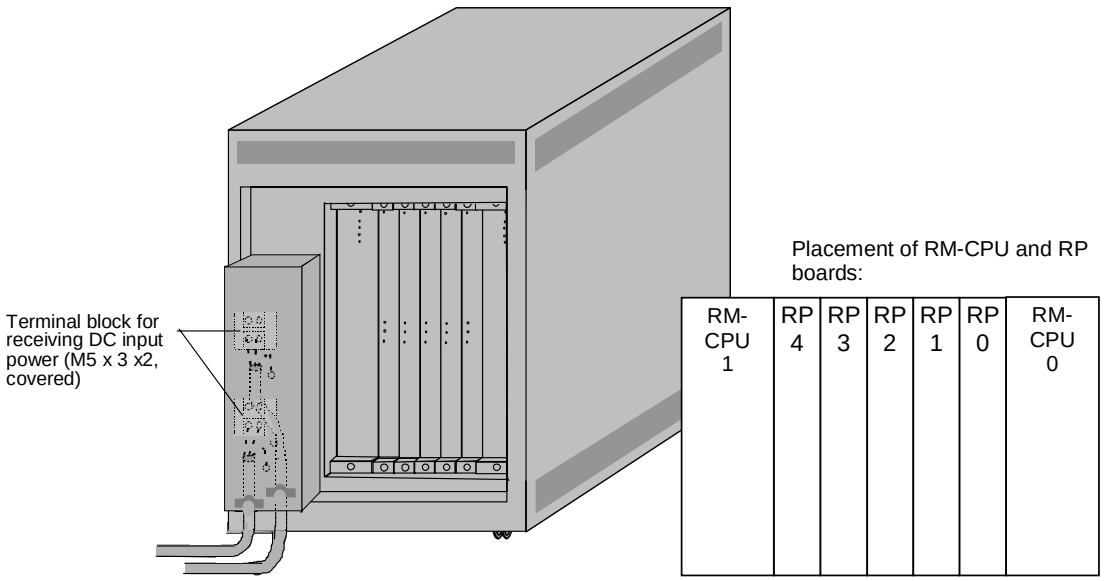


Figure 2-20 Rear View of GR2000-10 with DC Input

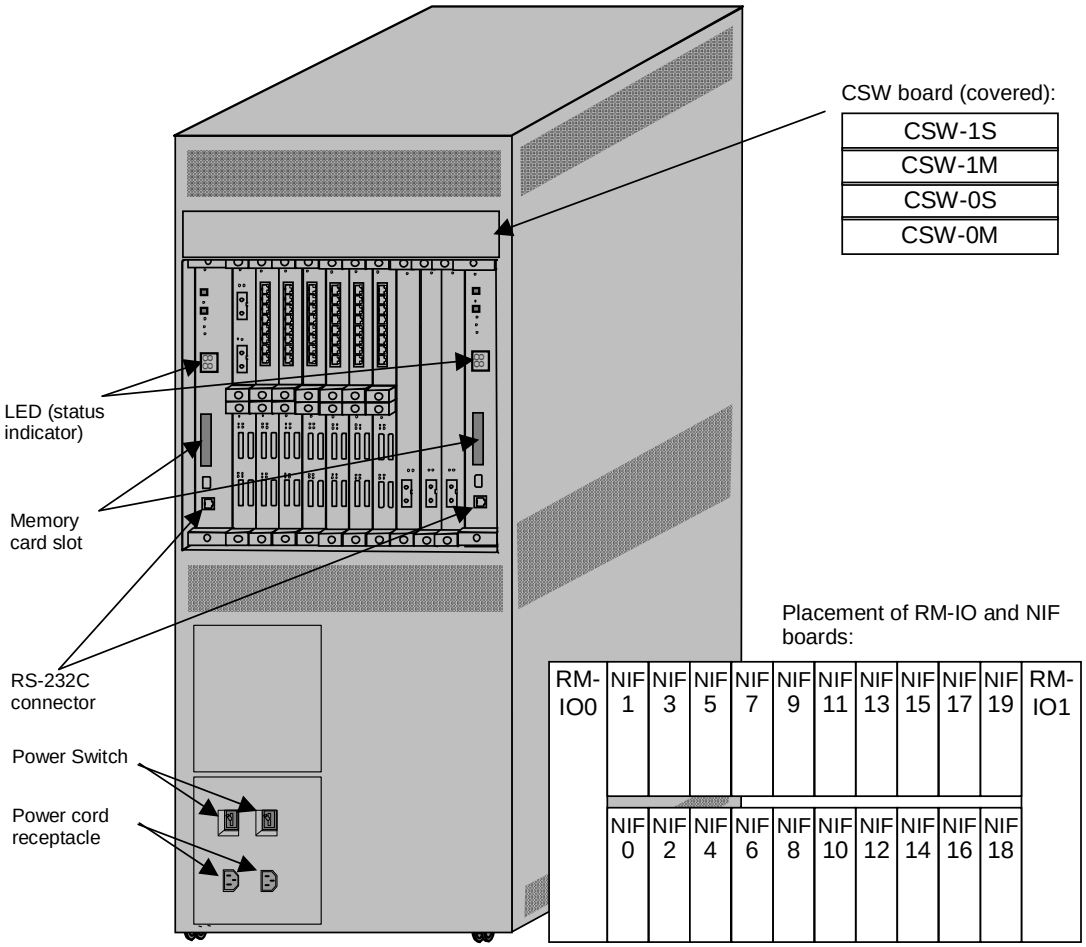


Figure 2-21 Front View of GR2000-20 with AC Input

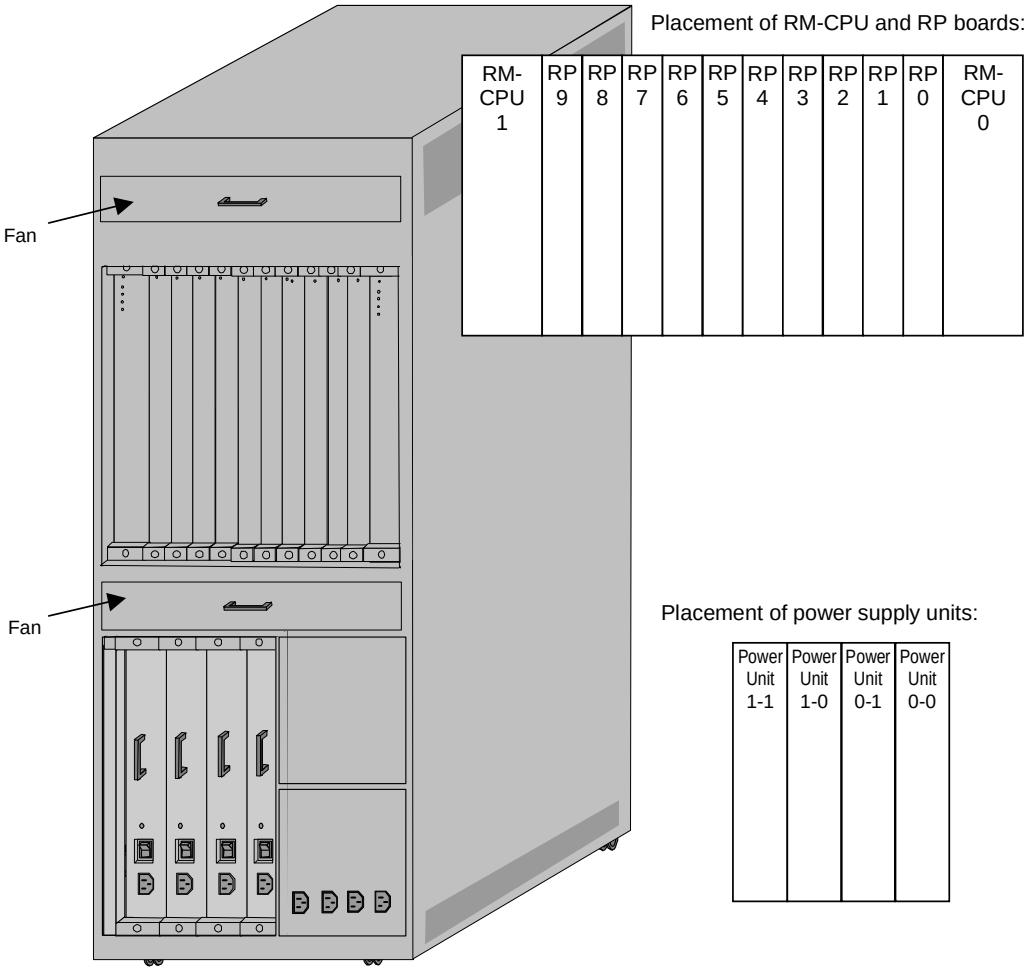


Figure 2-22 Rear View of GR2000-20 with AC Input

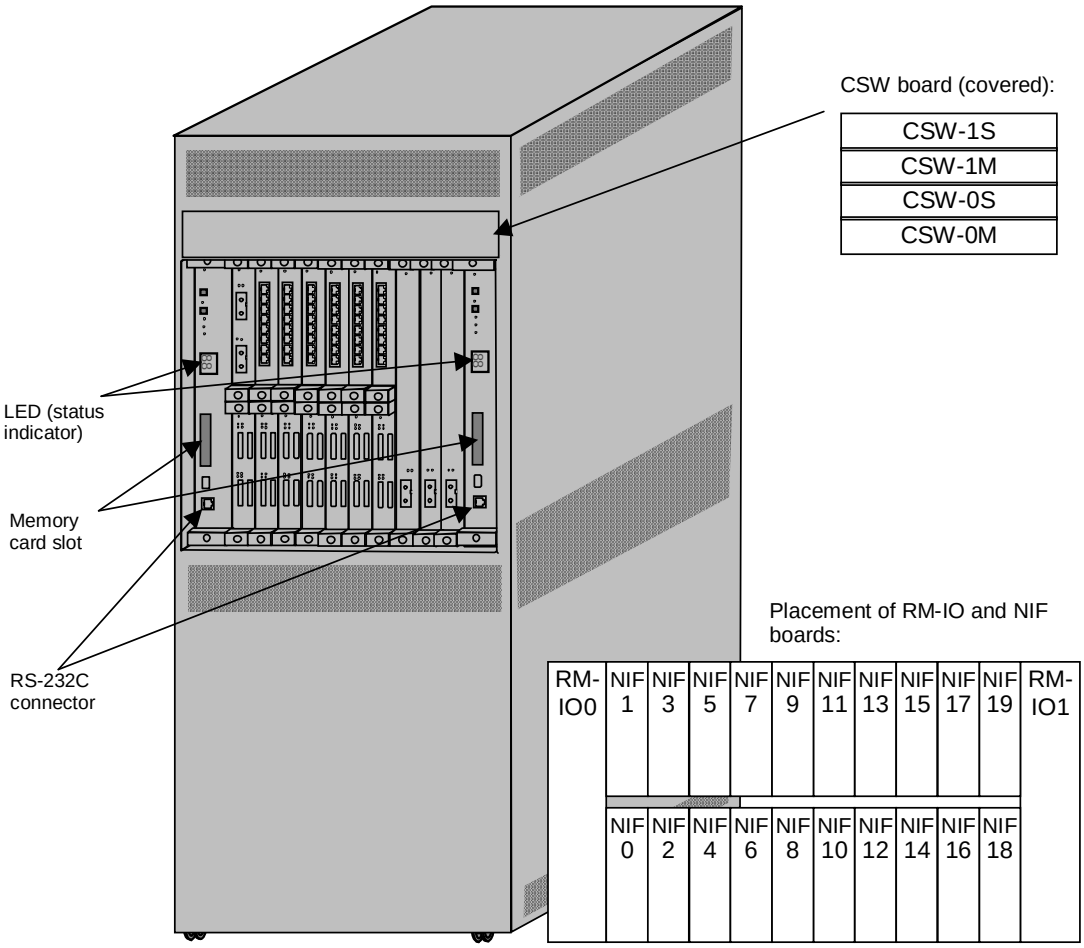


Figure 2-23 Front View of GR2000-20 with DC Input

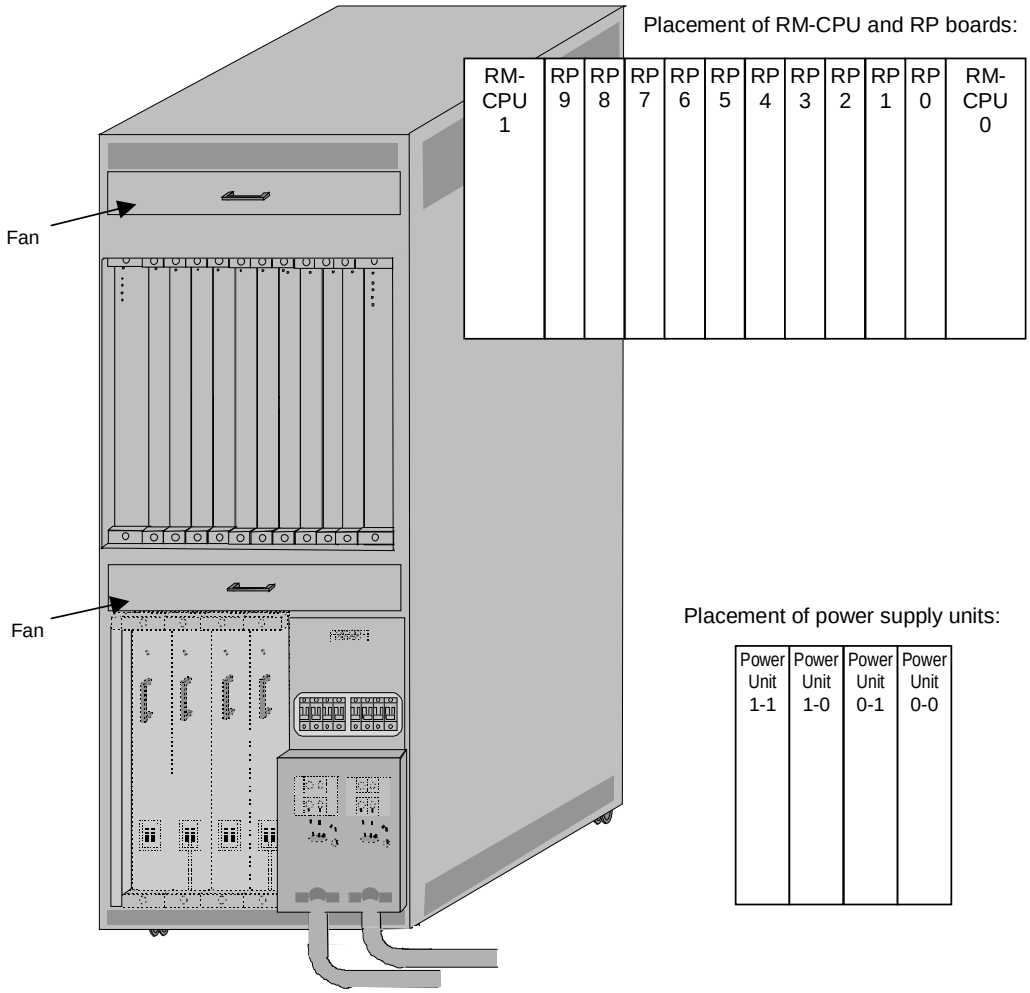


Figure 2-24 Rear View of GR2000-20 with DC Input

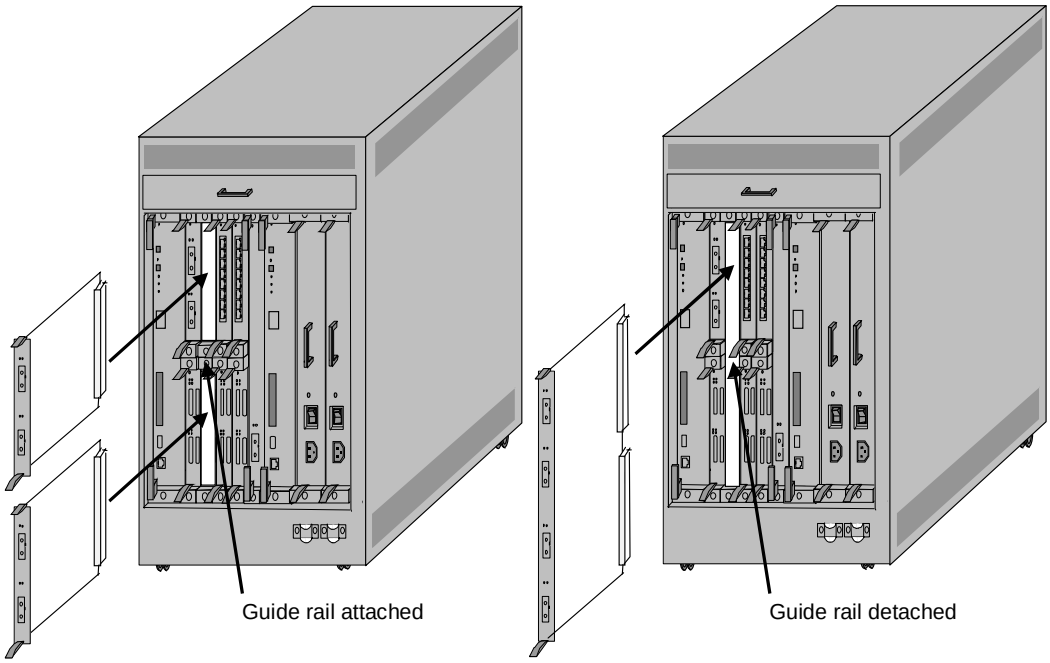


Figure 2-25 Half-Sized and Full-Sized NIF Modules

2.3 Device Configuration

All of the GR2000 models have the same architecture and share common components, including: Routing Manager (RM), Routing Processor (RP), Network Interface Unit (NIF), power supply subsystem (PS), and cabinet. In addition, the mid-range and high-end models (GR2000-6H, GR2000-10H, GR2000-20H) implement a highspeed RM–RP connection by means of the Crossbar Switch (CSW). The device components are collectively called the Basic Control Unit (BCU). A brief description of each component is given below:

- Routing Manager: The RM manages the entire router and processes routing protocols. The routing processes include creation and update of routing tables and forwarding routing tables to the Routing Processor (RP). In the GR2000-2S, the Routing Manager/Processor (RMP) integrates the functions of the RM and RP. In all other models, the RM is made up of two separate units: RM-CPU and RM-IO.
- Routing Processor (RP): The RP provides wire speed packet relaying in accordance with the routing table information supplied by the RM. It also performs ARP/ICMP processing, control of Network Interface Units, processing of network interface protocols (e.g., PPP, frame relay, and ATM), statistic functions, and error handling. In the GR2000-6H, GR2000-10H and GR2000-20H, an additional RP provides load balancing and faster processing speeds.
- Network Interface Unit (NIF): The NIF provides Layer 1 and Layer 2 support for various interfaces. Since the NIF is separate from the RP and provides for specific interfaces, a high degree of flexibility is achieved, meeting a wide range of user needs.
- Power Supply Unit (POW): The POW uses external power to generate a stable direct current for the internal units of the router. In the GR2000-4S, GR2000-6H, GR2000-10H and GR2000-20H, an additional POW provides a duplexed power supply configuration that improves the systems availability.
- Crossbar Switch (CSW): The CSW provides highspeed packet transfer between the RM and RP for the following models of GR2000-6H, GR2000-10H, GR2000-20H, GR2000-4, GR2000-10, and GR2000-20.
- Basic Control Unit (BCU): In the GR2000-2S, the BCU consists of an RMP (a duplexed BCU configuration is not available). In the GR2000-4S, the BCU consists of the RM (a duplexed BCU configuration is not available). In the GR2000-6H, GR2000-10H and GR2000-20H, the BCU consists of the RM and the CSW; a duplexed BCU configuration option is available and is independent of the duplexed power supply configuration. The BCU also contains the default memory on the RM, flash memory cards, and software.

Ease of operation and maintenance is achieved by the hot-swapping capability of components. On GR2000-2S, the NIF is hot-swappable when more than one NIF is installed; on GR2000-4S and GR2000-4, the NIF and the POW are hot-swappable when more than one NIF is installed, or when the power supply is duplexed. On the rest of the models, the BCU, RP, NIF, and POW are hot-swappable when the BCU is duplexed, more than one RP is installed, more than one NIF is installed, or the power supply is duplexed.

Figure 2-26, Figure 2-27, and Figure 2-28 show the block diagrams of the GR2000 models. A brief explanation of each model follows.

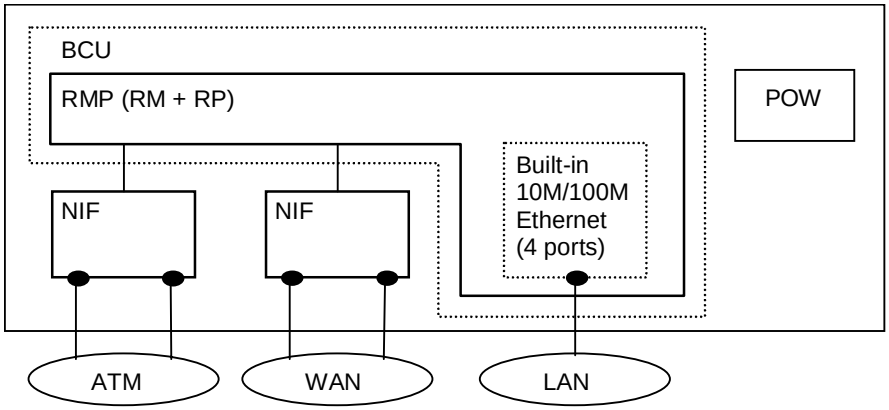


Figure 2-26 Block Diagram of GR2000-2S

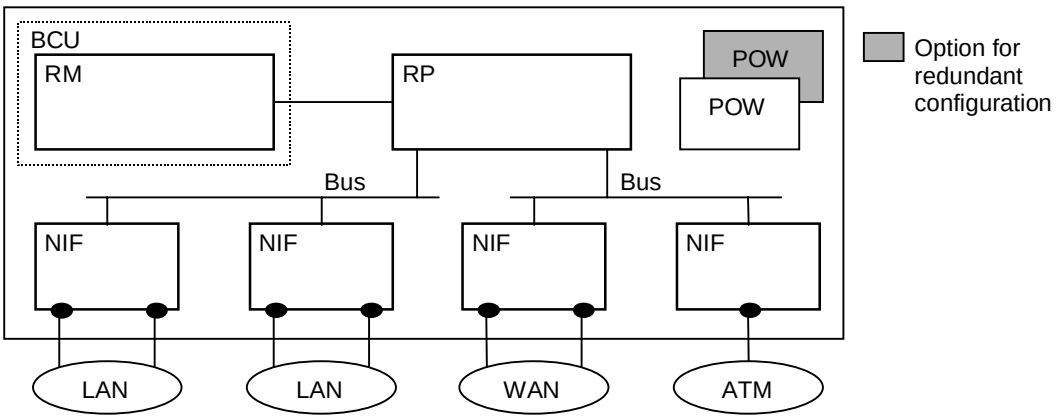


Figure 2-27 Block Diagram of GR2000-4S

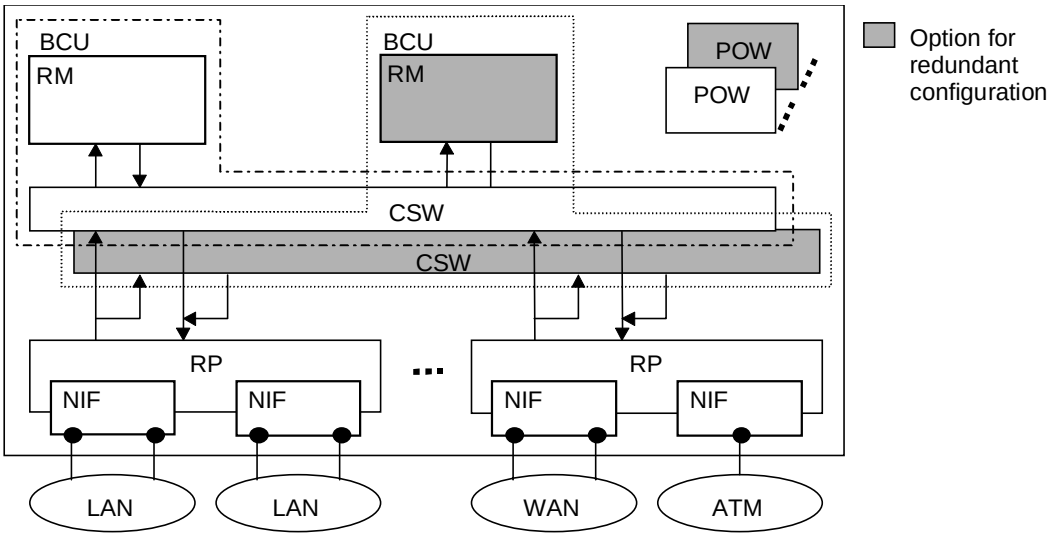


Figure 2-28 Block Diagram of GR2000-6H, GR2000-10H and GR2000-20H

GR2000-2S

The GR2000-2S incorporates one BCU with one 10M/100M Ethernet (4 ports), and one POW. The BCU consists of one RMP (equivalent of RM and RP) physically packaged in one RM-CPU module and one RMP module with one 10M/100M Ethernet (4 ports). Up to two NIFs can be installed on the GR2000-2S. Power supply redundancy is not available on this model.

The front view is shown in Fig. 2-10, the front appearance view of GR2000-2S, and the rear view in Fig. 2-11, the rear appearance view of GR2000-2S.

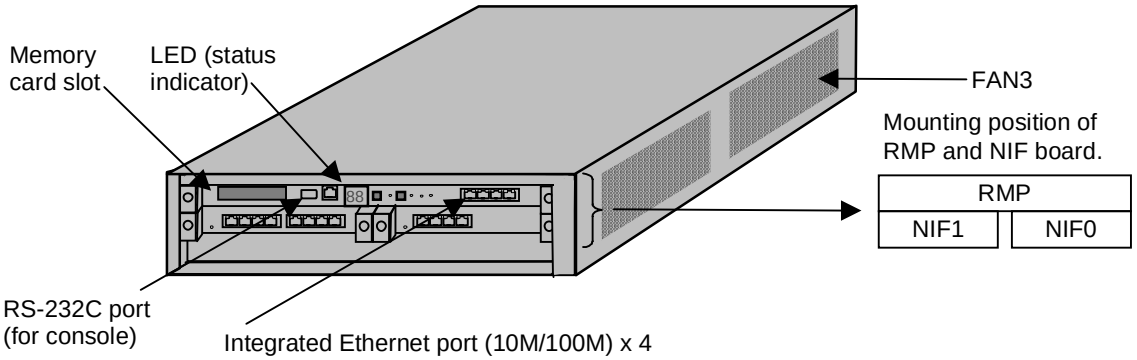


Figure 2-29 Front View of GR2000-2S

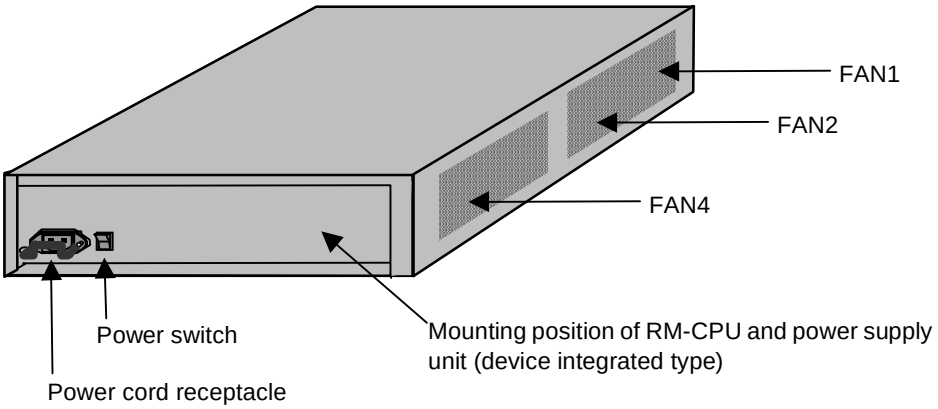


Figure 2-30 Rear View of GR2000-2S

GR2000-4S

This model incorporates one BCU, one RP, and one POW; the BCU consists of one RM physically packaged in one RM-CPU module and one RM-IO module. Up to four NIFs can be installed on this model. Power supply redundancy is made available by mounting one optional POW in the POW1 slot; otherwise, only the base POW is mounted in the POW0 slot. BCU redundancy, available on higher models, is not available on this model.

The front view is shown in Figure 2-31, the front appearance view of GR2000-4S, and the rear view in Figure 2-32, the rear appearance view of GR200-4S.

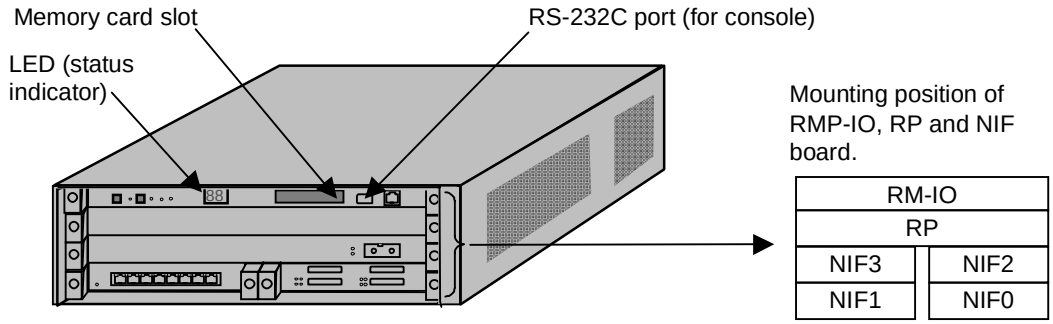


Figure 2-31 Front View of GR2000-4S

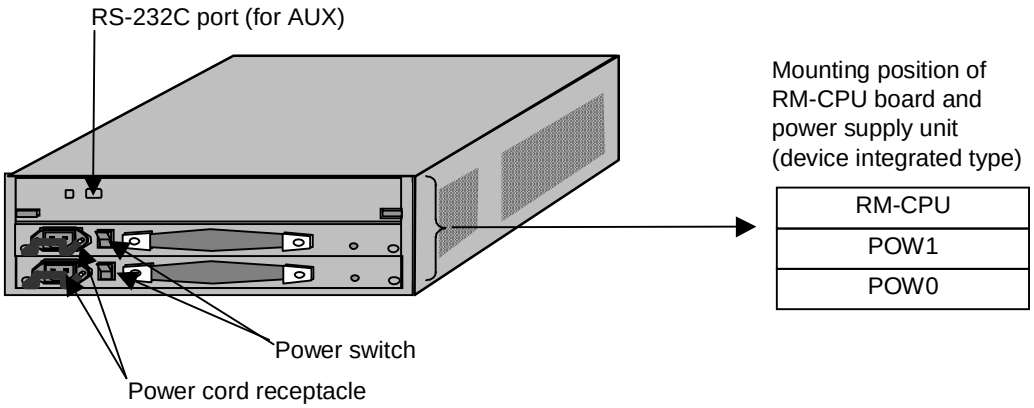


Figure 2-32 Rear View of GR2000-4S

GR2000-6H

This model incorporates one BCU, one RP, and one POW; the BCU consists of one RM and one CSW, and is physically packaged in one RM-CPU module and one RM-IO module. One BCU for redundancy, up to two additional RPs, and one POW for redundancy can be installed as options, independently of one another. Since one RP can handle up to two NIFs, a total of six NIFs can be installed on this model. The BCU redundancy is made available by mounting the optional RM-CPU and RM-IO modules in the RM-CPU1 and RM-IO1 slots; otherwise, only the base RM-CPU and RM-IO modules are mounted in the RM-CPU0 and RM-IO0 slots. Similarly, the power supply redundancy is made available by mounting the optional POW in the POW1 slot; otherwise, only the base POW is mounted in the POW0 slot.

The front view is shown in Figure 2-33, the front appearance view of GR2000-6H, and the rear view in Figure 2-34, the rear appearance view of GR2000-6H.

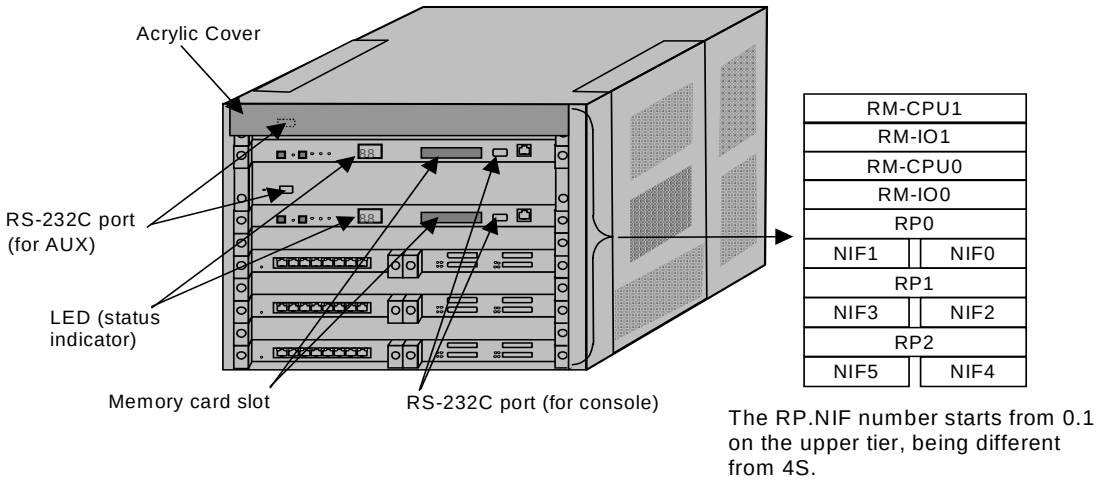


Figure 2-33 Front View of GR2000-6H

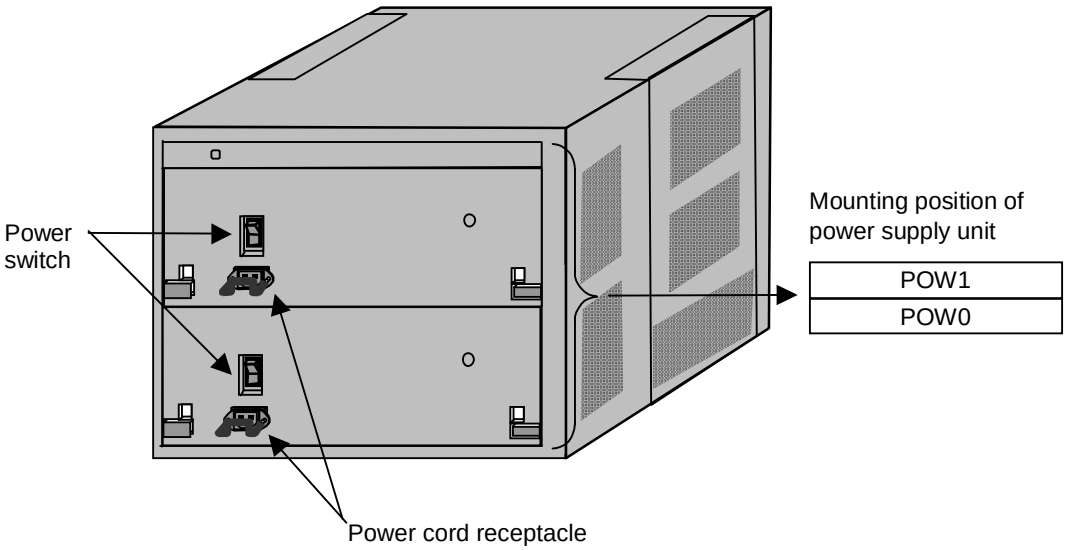


Figure 2-34 Rear View of GR2000-6H

GR2000-10H

This model incorporates one BCU, one RP, and two POWs; the BCU consists of one RM and one CSW, and is physically packaged in one RM-CPU module and one RM-IO module. One BCU for redundancy, up to four additional RPs, and two POWs for redundancy can be installed as options, independently of one another. Since one RP can handle up to two NIFs, a total of ten NIFs can be installed on this model. The BCU redundancy is made available by mounting the optional RM-CPU and RM-IO modules in the RM-CPU1 and RM-IO1 slots; otherwise, only the base RM-CPU and RM-IO modules are mounted in the RM-CPU0 and RM-IO0 slots.

The front view when PS is mounted with an AC input unit is shown in Figure 2-35, the front appearance view of GR2000-10H (AC input), and the rear view in Figure 2-36, the rear appearance view of GR200-10H(AC input).

For the device configuration when PS is mounted with a DC input unit, and the PS mounting position, please refer to the "Hardware operation manual".

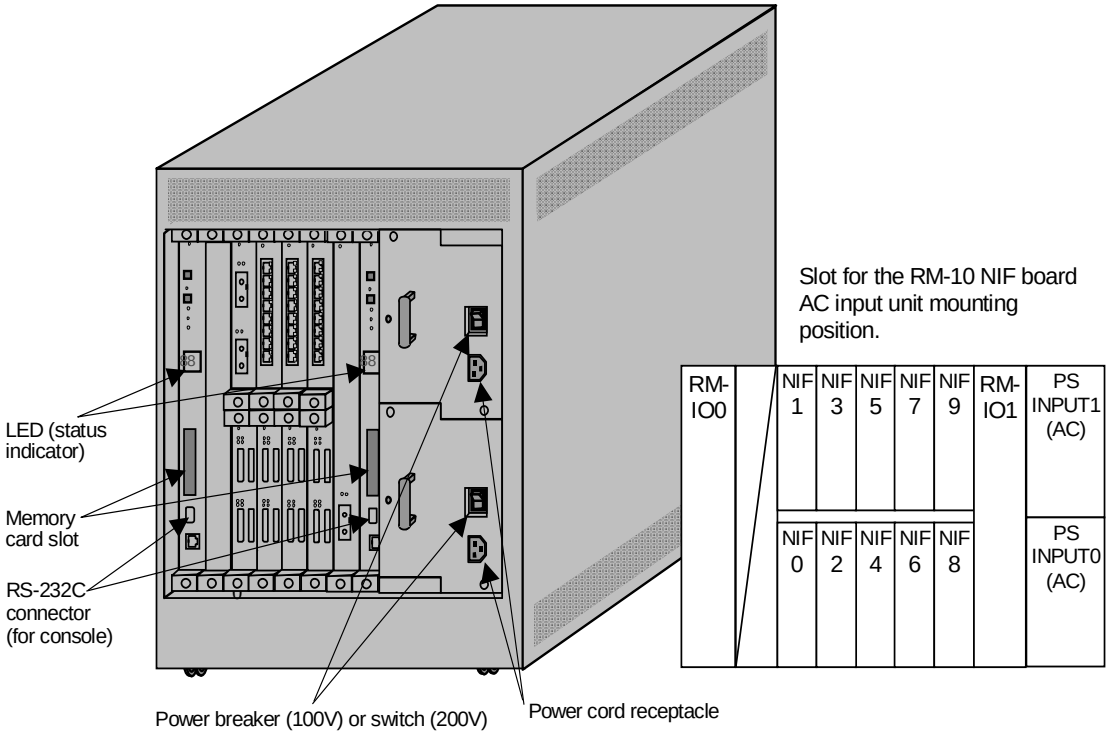


Figure 2-35 Front View of GR2000-10H with AC Input

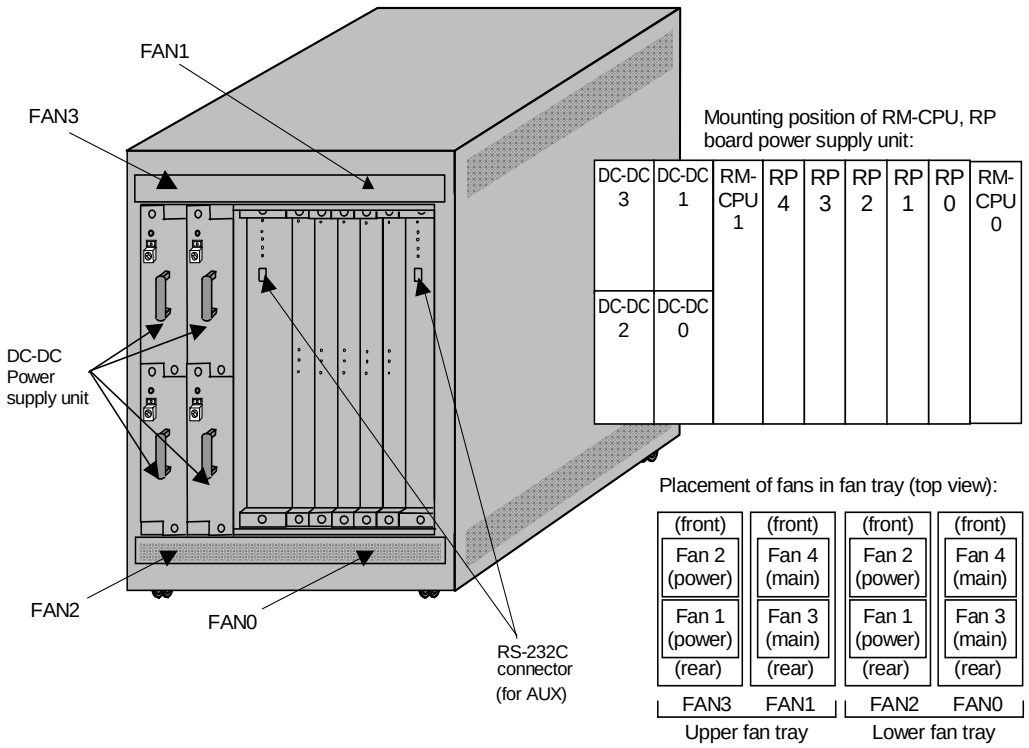


Figure 2-36 Rear View of GR2000-10H with AC Input

GR2000-20H

This model incorporates one BCU, one RP, and three POWs; the BCU consists of one RM physically packaged in one RM-CPU module and one RM-IO module, and one CSW physically packaged in one master CSW module (CSW-M) and one sub CSW module (CSW-S). One BCU for redundancy, up to nine additional RPs, and three POWs for redundancy can be installed as options, independently of one another. Since one RP can handle up to two NIFs, a total of twenty NIFs can be installed on this model. The BCU redundancy is made available by mounting the optional RM-CPU, RM-IO, CSW-M, and CSW-S modules in the RM-CPU1, RM-IO1, CSW-1M, and CSW-1S slots; otherwise, only the base RM-CPU, RM-IO, CSW-M, and CSW-S modules are mounted in the RM-CPU0, RM-IO0, CSW-0M, and CSW-0S slots.

The front view is shown in Figure 2-37, the front appearance view of GR2000-20H (AC input), and the rear view in Figure 2-38, the rear appearance view of GR200-20H(AC input).

For the device configuration when PS is mounted with a DC input unit, and the PS mounting position, please refer to the "Hardware operation manual".

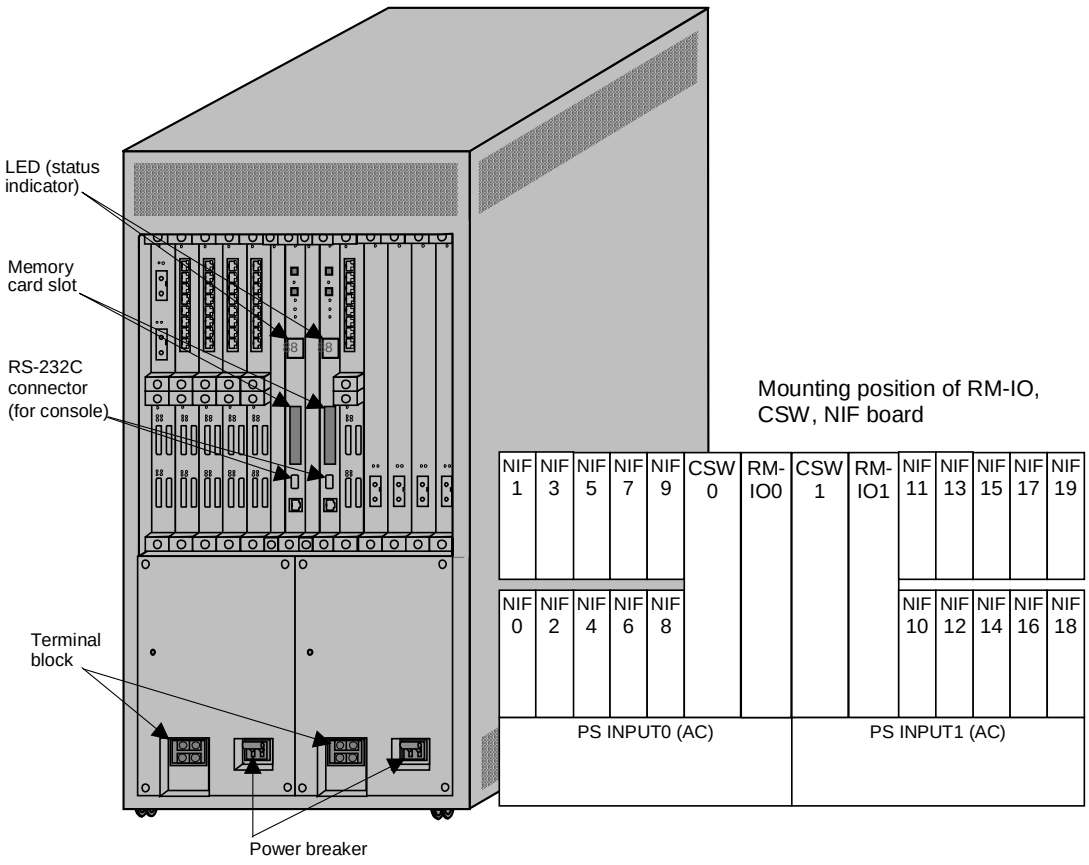


Figure 2-37 Front View of GR2000-20H with AC Input

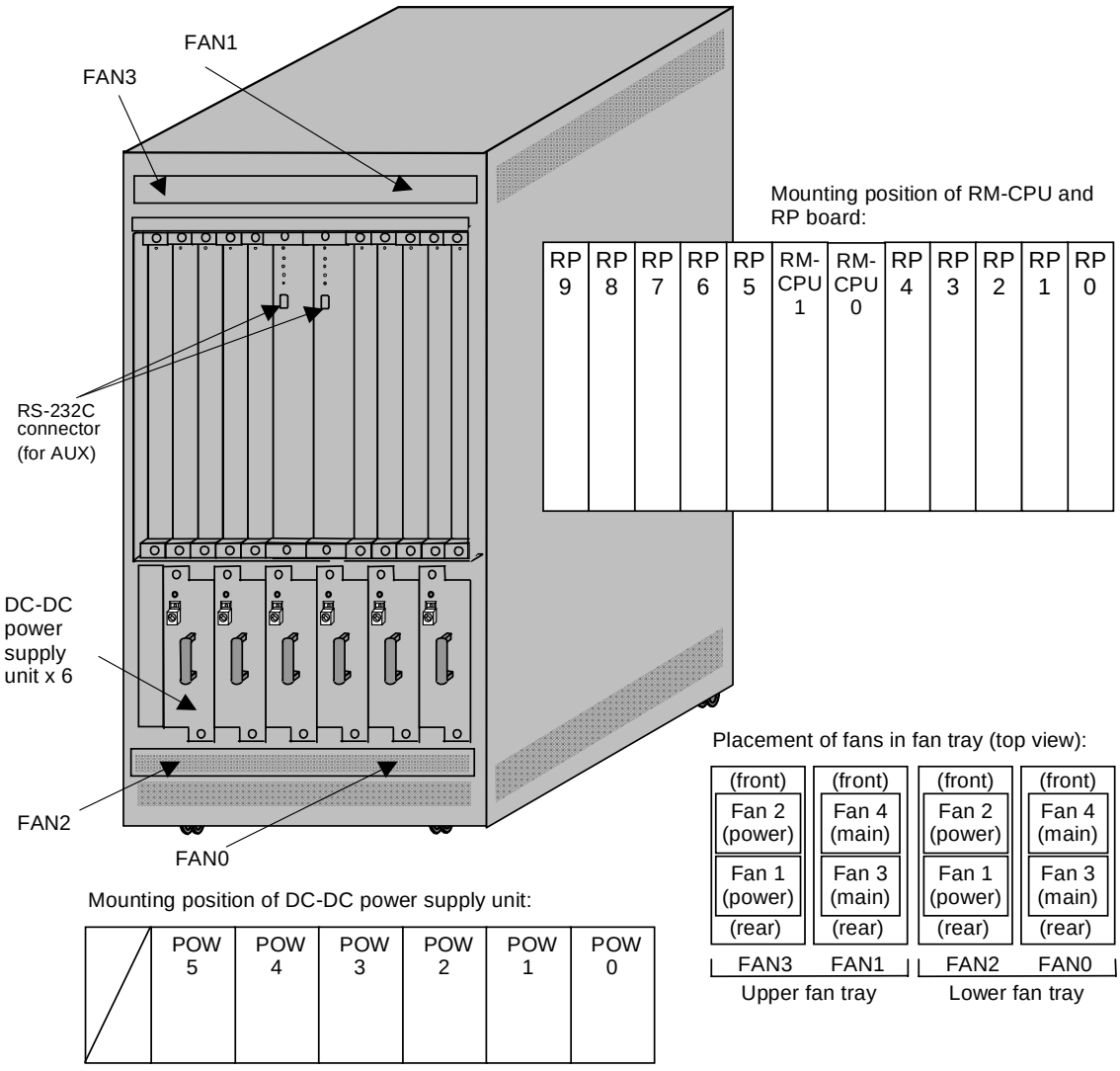


Figure 2-38 Rear View of GR2000-20H with AC Input

2.4 Device Components

Table 2-1 and Table 2-3 show the maximum number of device components described in this section, depending on the target GR2000 model.

Table 2-1 Maximum Number of Device Components on Enhanced Models

Device Component		GR2000-2S	GR2000-4S	GR2000-6H	GR2000-10H	GR2000-20H
Power Supply Unit (POW)		1	2	2	1	1
Additional POW (POWA)		0	0**	0**	1	1
Basic Control Unit (BCU)		1	1	2	2	2
(a) Main memory (MS64, MS128, MS256)***	BCU other than below	2	2	2/BCU	2/BCU	2/BCU
	BCU-H850H BCU-M850H BCU-L850H	-	-	4/BCU	4/BCU	4/BCU
(b) Memory Card (MC64)		2	2	2/BCU	2/BCU	2/BCU
Pouting Processor (RP)		0*	1	3	5	10
(a) Main memory (MS64)	RP-A1	1	1/RP	1/RP	1/RP	1/RP
	RP-C	-	-	0	0	0
	RP-D	-	1/RP	1/RP	1/RP	1/RP
	RP-C6, RP-D6	-	-	1/RP	1/RP	1/RP
(b) Main memory (MS128)	RP-A1	-	-	-	-	-
	RP-C	-	-	0	0	0
	RP-D	-	0	0	0	0
	RP-C6, RP-D6	-	-	1/RP	1/RP	1/RP
Network Interface Unit (NIF)		2	4	6	10	20

Notes:
** One RP-A1equivalent is incorporated in BCU on GR2000-25.*
*** Power supply redundancy is implemented by installing two POWs on GR2000-4S, 6H.*
**** MS256 is dedicated for BCU-H850H, BCU-M850H, and BCU-L850H.*

2.4.1 Cabinet (Network Processor Unit Chassis)

Each model of the GR2000 family has its own cabinet that includes one or more fans for cooling. See Figures 2-1 thru 2-24 in 2.2 for their external images.

Table 2-2 Each cabinet and maximum number of modules that can be mounted Device Cabinet

Device cabinet	Constituting element	Maximum number of modules that can be mounted	Remarks
GR2000-2S	BCU (RM-CPU and RMP)	1 (Built in.)	
	Corresponding to RP-A1.	1 (Built in.)	
	NIF	2	
	PS	1 (Built in.)	
GR2000-4S	BCU (RM)	1	
	RP	1	
	NIF	4	
	PS	2	Possible of duplication.
GR2000-6H	BCU (RM and CSW)	2	Possible of duplication.
	RP	3	
	NIF	6	
	PS	2	Possible of duplication.
GR2000-10H	BCU (RM and CSW)	2	Possible of duplication.
	RP	5	
	NIF	10	
	PS	4	
GR2000-20H	BCU (RM)	2	Possible of duplication.
	CSW	2	Possible of duplication.
	RP	10	
	NIF	20	
	PS	6	Possible of duplication.

2.4.2 Basic Control Unit (BCU)

The components of the BCU vary depending on the GR2000 models as shown below.

Table 2-3 Abbreviation for BCU model names and configuration of each device

Device cabinet	Abbreviation for BCU model name	Configuration
GR2000-2S	Built in cabinet	• RM-CPU(2S) board • RMP boards (to handle RM-IO, RP-A1, 10BASE-T/ 100BASE/TX (4 boards) are built in).
GR2000-4S	BDU-S300S	• RM-CPU (4S) board • RM-IO (4S) board
GR2000-6H	BCU-H300H	• RM-CPU (HH) board • RM-IO (H) board (Built-in 4x4 cross bar switch)
	BCU-H850H	• RMB-CPU (HH) board • RMB-IO (H) board (Built in 4x4 cross bar switch)

Table 2-3 Abbreviation for BCU model names and configuration of each device

Device cabinet	Abbreviation for BCU model name	Configuration
GR2000-10H	BCU-M300H	• RM-CPU (MH) board • RM-IO (H) board (Built in 6x6 cross bar switch)
	BCU-M850H	• RMB-CPU (MH) board • RMB-IO (H) board (Built in 6x6 cross bar switch)
GR2000-20H	BCU-L300H	• RM-CPU (LH) board • RM-IO (H) board
	BCU-L850H	• RMB-CPU (LH) board • RMB-IO (H) board

2.4.2.1 RM-CPU

Each RM-CPU contains one K6-2 [300 MHz] processor and two main memory slots. Each memory slot accepts a 64 MB memory module (MS64) and a 128 MB memory module (MS128), thus being able to configure up to 256 MB of memory. In addition, each RM-CPU of GR2000-4S, GR2000-6H, GR2000-10H, and GR2000-20H includes one RS-232C AUX port.

2.4.2.2 RM-IO

Each RM-IO has one RS232 console port, two memory card (MC) slots, one 10BASE-T port, and a packet-forwarding ASIC.

2.4.2.3 RMB-CPU

Each RMB-CPU has a common Pentium III (850 MHz) and four main storage (MS) slots. Since the main storage of 256 bytes (MS256) can be mounted, a memory of 1G bytes as maximum can be mounted.

Being different from RM-IO, BCU-S850S, BCU-H850H, BCU-M850H, and BCU-L850H have the RS-232C AUX board in RMB-IO.

2.4.2.4 RMB-IO

RMB-IO has two RS232C console boards, two memory card (MC) mechanism slots, one board of 10BASE-T/100BASE-TX, and a packet forwarding engine (Packet Forwarding ASIC).

Duplication of BCU is possible only in GR2000-6H, GR2000-10H and GR2000-20H by mounting two sets of BCU.

2.4.2.5 Crossbar Switch (CSW)

The CSW provides highspeed packet transfer between the RM and the RP on the models of GR2000-6H, GR2000-10H and GR2000-20H.

On GR2000-6H, the CSW is included in the RM-CPU board. Its 3-by-3 crossbar switch performs highspeed packet transfer between RM and up to 3 RPs.

On GR2000-10H, the CSW is included in the RM-CPU board. Its 6-by-6 crossbar switch performs highspeed packet transfer between RM and up to 5 RPs.

On GR2000-20H, the CSW is implemented as two separate boards (CSWM and CSWS), one acting as backup. Its 11-by-11 crossbar switch performs highspeed packet transfer between RM and up to 10 RPs.

2.4.3 Routing Processor Module(RP)

The RP uses the routing table from the RP to perform packet relay, ARP and ICMP processing, NIF control, protocol handling on the data link layers (for PPP, frame relay, and ATM), statistics, and fault handling, etc. The GR2000-6H, GR2000-10H, and GR2000-20H use the load distribution method to allow the use of more than one RP simultaneously.

The RP contains a packet forwarding engine (implemented by an ASIC), a routing/QoS and filtering table lookup engine (implemented by an ASIC) that performs hardware-based routing table lookup, and a filtering table and QoS table lookup. This hardware-based method allows faster IP forwarding and QoS services.

The RP uses software for network layer handling (for PPP, frame relay, ATM, etc.), IPX, packet relay on bridges, statistics, and fault handling.

The RP has two types of RPs: RP-A1 and RP-D for low to high-speed line control and RP-C for ultrahigh-speed line control. Table 2-4 shows the specifications for each RP.

The GR2000-2S contains an RP-A1 equivalent.

Table 2-4 RP Specifications

RP name	Specification	Note
RP-A1	Backup, QoS/Diff-serv, and multicasting Packet transfer rate: Approx. 1M packets/s MS = 32MB (standard) - 96MB (max)	GR2000-2S: Not mountable
RP-DV	RP-DV is a routing processor to which the label stack H/W transfer function has been enhanced. Packet transfer rate: Approx. 4M packets/s MS = 128MB (fixed) • The packet transfer engine is commonly used for transmission and reception. • Routing retrieval engines are mounted exclusively for transmission and reception, respectively. • The mounted processor is MIPS RM7000 |250Mhz|.	GR2000-4S,2S: Not mountable GR2000-10,20: Mountable with some limitations (*1)
RP-D	In addition to the RP-A1's features, MPLS and Tag VLAN coupling Packet transfer rate: Approx. 1M packets/s MS = 64MB (standard) - 128MB (max) • Packet transfer engine is used commonly for transmission and reception. • Routing retrieval engine is used commonly for transmission and reception. • The mounted processor is MIPS RM7000 |250Mhz|.	GR2000-2S: Not mountable GR2000-4S: Mountable with some feature limitations (*2)
RP-C	RP-C is a routing processor to accommodate high-speed lines including OC-48c, which has a packet processing performance about four times greater than that of RPA1. GR2000 IPv6 compatible Has RP-C function IPv6, IPv4 dual stack Packet transfer rate: 4.0Mpps (IPv4) (Full duplex)2.6Mpps (IPv6) MS = 128MB (standard) - 256MB (max) • Packet transfer engines are mounted exclusively for transmission and reception, respectively. • Routing retrieval engines are mounted exclusively for transmission and reception, respectively. • The mounted processor is MIPS RM7000 |250Mhz|.	GR2000-4S, -2S: Not mountable GR2000-10, -20: Separate price quote

Table 2-4 RP Specifications

RP name	Specification	Note
RP-D6	GR2000 IPv6 compatible Has RP-D function IPv6, IPv4 dual stack Packet transfer rate: 1.0Mpps (IPv4) (Full duplex)0.8Mpps (IPv6) MS = 128MB (standard) - 256MB (max) • Packet transfer engine is used commonly for transmission and reception. • Routing retrieval engine is used commonly for transmission and reception. • The mounted processor is MIPS RM7000 |250Mhz|.	GR2000-2S: Not mountable
RP-C6	RP-C6 is a routing processor to which the hardware routing function of IPv6 has been enhanced on RP-C to accommodate high-speed lines such as OC-48c and the gigabit Ethernet of multi-port versions. Its hardware configuration is as follows: • The packet transfer engines are exclusively mounted for transmission and reception. • The routing retrieval engines are exclusively mounted for transmission and reception. • The mounted processor is MIPS RM7000 "250 MHz". • A memory of 128 M bytes is mounted in a fixed way.	
RP-CV	RP-CV is a routing processor to which the hardware routing function of IPv6 has been enhanced on RP-C to accommodate high-speed lines such as OC-48c and the gigabit Ethernet of multi-port versions. Its hardware configuration is as follows: • The packet transfer engines are exclusively mounted for transmission and reception. • The routing retrieval engines are exclusively mounted for transmission and reception. • The mounted processor is MIPS RM7000 "250 MHz". • A memory of 128 M bytes is mounted in a fixed way.	
*(*1) For the GR2000-10/20, there are some limitations on installation of RP-C boards and NIF modules supporting them. For more information, see "adding enhanced features" in Section 7.1.1.* *(*2) The MPLS or MPLS-based IP-VPN feature is not available for the GR2000-2S/4S.*		

2.4.4 Network Interface Module (NIF)

The NIF provides Layer 1 and Layer 2 support for various WAN and LAN interfaces. The NIF includes half-size and full-size boards. See Table 2-5 for a list of NIF modules.

Table 2-5 List of NIF Modules

Type	Module Name	Interface	Size
LAN	NE100-8T	10BASE-T/100BASE-TX 8 ports	half
	NE100-8TA	10BASE-T/100BASE-TX 8 ports (VRRP and MPLS supported)	half
	NE100-8TB	10BASE-T/100BASE-TX 8 ports(VRRP, MPLS, VLAN, band control supported)	half
	NE100-4F	100BASE-FX (long wavelength 1300 nm, normal, multimode fiber) 4 ports	half
	NE100-4FS**	100BASE-FX (middle) (long wavelength 1300 nm, middle distance, single-mode fiber) 4 ports	half
	NE100-4FS4**	100BASE-FX (long) (long wavelength 1300 nm, long distance, single-mode fiber) 4 ports	half
	NE1G-1S	1000BASE-SX (short wavelength 850 nm) 1 port	full
	NE1G-1SA	1000BASE-SX (short wavelength 850 nm) 1 port (VRRP supported)	full
	NE1G-1SB	1000BASE-SX(short wavelength 850nm) 1 port(VRRP,MPLS,VLAN,band control supported)	full
	NE1G-1L	1000BASE-LX (long wavelength 1300 nm) 1 port	full
	NE1G-1LA	1000BASE-LX (long wavelength 1300 nm) 1 port (VRRP supported)	full
	NE1G-1LB	1000BASE-LX(short wavelength 1300nm) 1 port(VRRP,MPLS,VLAN,band control supported)	full
	NE1G-1LHA**	1000BASE-LH (long wavelength 1500 nm) 1 port	full
	NE1G-1LHA8**	1000BASE-LH8 (long wavelength 1500 nm) 1 port (80 km supported)	full
	NE1G-1LHBA**	1000BASE-LH(long wavelength 1500nm) 1port (100km , VRRP,MPLS,VLAN, band control supported)	full
	NE1G-4C	1000BASE-SX, 1000BASE-LX, 1000BASE-LH 4ports (GBIC supported) (VRRP,MPLS,VLAN, band control supported)	full
WAN	NWVX-4	V24 (up to 64 k) /V35 (up to 6 M) /X21 (up to 6 M) synchronization serial 4 ports	half
	NWVX-8	V24 (up to 64 k) /V35 (up to 2 M) /X21 (up to 2 M) synchronization serial 8 ports	half
	NWJB-8*	Basic interface (64/128k) 8 ports (leased line/ISDN)	half
	NWMX1-4*	High-speed digital (1.5M) 2 ports plus Basic interface (64/128k) 2 ports (leased line/ISDN)	half
	NWJ1-4U*	High-speed digital (1.5M) 4 ports (leased line/ISDN)	half
	NWJ1-8U*	High-speed digital (1.5M) 8 ports (leased line/ISDN)	half
	NWT1-4	High-speed digital (1.5M) 4 ports (North America)	half
	NWE1-4	High-speed digital (2M) 4 ports (Europe, Asia)	half
	NWE1-8	High-speed digital (2M) 8 ports (MPLS supported)	half
	NWJ2-1U *	High-speed digital (6M) 1 port	half
	NWT3-2U	High-speed digital (non-multiplex 45M) 2 ports	half

Table 2-5 List of NIF Modules

	NWE3-2U	High-speed digital (non-multiplex 35M) 2 ports	half
	NWE3-1C	High-speed digital (mutiplex 34M) 1 port	half
	NWOC3C-2M	SONET/SDH OC-3c/STM-1(150M) POS 2 ports (multimode fiber)	half
	NWOC3C-2MD	SONET/SDH OC-3c/STM-1 (150M) POS 2 ports (multimode fiber)(MPLS supported)	half
	NWOC3C-8M	SONET/SDH OC-3c/STM-1 (150M) POS 8 ports (multimode fiber) 2km	full
	NWOC3C-2S	SONET/SDH OC-3c/STM-1(150M) POS 2 ports (single-mode fiber)	half
	NWOC3C-2SD	SONET/SDH OC-3c/STM-1 (150M) POS 2 ports (single-mode fiber) (MPLS supported)	half
	NWOC3C-8S	SONET/SDH OC-3c/STM-1 (150M) POS 8 ports (single-mode fiber) 15km	full
	NWOC12-4M	SONET/SDH OC-12c/STM-4 (600M) POS 4 ports (multimode fiber) 500m	full
	NWOC12C-1S	SONET/SDH OC-12c/STM-4(600M) POS 1 port (single-mode fiber)	full
	NWOC12-1SD	SONET/SDH OC-12c/STM-4 (600M) POS 1 port (single-mode fiber) (MPLS supported)	full
	NWOC12-4S	SONET/SDH OC-12c/STM-4 (600M) POS 4 ports (single-mode fiber) 15km	full
	NWOC48-1S	SONET/SDH OC-48c/STM-16(2.4G) POS 1 port (single-mode fiber) 2km	full
	NWOC48-1S4	SONET/SDH OC-48c/STM-16(2.4G) POS 1 port (single-mode fiber) 40km	full
	NWOC48-1S8	SONET/SDH OC-48c/STM-16 (2.4G)POS 1 port (single-mode fiber) 80km	full
	NWOC48-1A	SONET/SDH OC-48c/STM-16 (2.4G) POS 1 port (single-mode fiber) 2km (APS supported)	full
	NWOC48-1A4	SONET/SDH OC-48c/STM-16 (2.4G) POS 1 port (single-mode fiber) 40km (APS supported)	full
	NWOC48-1A8	SONET/SDH OC-48c/STM-16 (2.4G) POS 1 port (single-mode fiber) 80km (APS supported)	full
ATM	NA25M-1*	25Mbps ATM 1 port	half
	NAOC3-1M	SONET/SDH OC-3/STM-1(150M) ATM 1 port (multimode fiber)	half
	NAOC3-1S	SONET/SDH OC-3/STM-1(150M) ATM 1 port (single-mode fiber)	half
	NAOC3-8M**	SONET/SDH OC-3c/STM-1(150M) ATM 8 ports(multimode fiber)	full
	NAOC3-8S**	SONET/SDH OC-3c/STM-1(150M) ATM 8 ports(single-mode fiber)	full
	NAOC12-2M**	SONET/SDH OC-12c/STM-4 (600M) ATM 2 ports (mulimode fiber)	full
	NAOC12-2S**	SONET/SDH OC-12c/STM-4 (600M) ATM 2 ports (sigle-mode fiber)	full

** These interfaces are for use in Japan only.*
*** Product intended for the Japanese market handled only by Hitachi Japan.*

2.4.5 Power Supply Unit (POW)

The POW receives externally-sourced input power and generates stable direct voltage current (5V, 3.3V, 12V, and 24V) for the router. For input power, GR2000-2S and GR2000-4S can receive 100 or 200 VAC (50/60 Hz); GR2000-6H and GR2000-10H can receive 100 or 200 VAC (50/60 Hz), or –48 or –60 VDC if DC input power option is installed; GR2000-20H can receive 200 VAC (50/60 Hz), or –48 or –60 VDC if DC input power option is installed.

In any power supply that is duplicable, the external power supply cables are independent, thus duplication is possible in the external power supply system. For the configuration of each power supply module, please refer to the "Facility plan".

The power supply configuration and specific POW model name vary depending on the GR2000 models as shown below.

Table 2-6 PS model name for each device

Device cabinet	Power supply type	PS model name	Duplication
GR2000-2S	AC100V	PS is built in cabinet.	
GR2000-4S	AC100V	POW-S100S	Duplication by using two POW-S100S.
GR2000-6H	AC100V	POW-H100H	Duplication by using two POW-H100H.
	DC-48V	POW-HDCH	Duplication by using two POW-HDCH.
GR2000-10H	AC100V	POW-M100H	--
		POW-M100HA	Redundancy mechanism for POW-M100H
	AC200V	POW-M200H	--
		POW-M200HA	Redundancy mechanism for POW-M200H
	DC-48V	POW-MDCH	--
		POW-MDCHA	Redundancy mechanism for POW-MDCH
GR2000-20H	AC200V	POW-L200H	--
		POW-L200HA	Redundancy mechanism for POW-L200H
	DC-48V	POW-LDCH	--
		POW-LDCHA	Redundancy mechanism for POW-LDCH

2.4.6 CPU Fan

The CPU fan, located on the RM-CPU board of the BCU has a life expectancy of 100,000 hours of operation.

2.4.7 Main Storage Card (MS)

The router uses two different capacities of memory cards: the MS64 with 64 MB is used on the BCU and RP, while the MS128 with 128 MB on the BCU only.

2.4.8 Flash Memory Card (MC)

The router uses two different capacities of flash memory cards: 30 MB MC30 and 64 MB MC64. Either card stores the software, configuration files, and log information.

2.4.9 Interface Cables

Only leased interface cables for V.24/V.35/X.21 of serial channel are available. NIF shares the same connector as V.24/V.35/X.21, but the cable differs depending on the type of interface.

Except for those above mentioned, all interface cables must be procured by the customer. For the interface cable specifications, see section 2.5.

2.4.10 NIF accessory (GBIC)

To use NE1G-4C in NIF, any one of the following GBIC will be required. If any GBIC other than those described below is used, no operation will be guaranteed.

Table 2-7 GBIC type

Model abbreviation	Summarized specification
GBIC-SX	GBIC for 1000BASE/SX
GBIC-LX	GBIC for 1000BASE/LX
GBIC-LH	GBIC (handling 70 km) for 1000BASE/LH

Table 2-8 GBIC-SX/LX/LH Physical Specifications (Purchasing overseas)

GBIC type	Vendor	P/N
GBIC-SX	IBM	IBM42S12SNYAA20
	CIELO	GBE1250SW-1
	FINISAR	FTR-8519
GBIC-LX	IBM	IBM42S12LNYAA20
	CIELO	GBE1250LW-1
GBIC-LH	EXTREME	ZX-GBIC

Since GBIC is not exported at the present, customers should purchase for themselves referring to Table 2-8 if it is to be used in other countries.

2.4.11 Temperature monitoring sensor

One temperature monitoring sensor is mounted in each of RMB-IO board and RMB-CPU board. The measuring accuracy is Å}3Åé (Max). If the temperature monitored by the temperature monitoring sensor exceeds the temperature surveillance threshold value shown in Table 2-6: The temperature surveillance threshold value for RMB-CPU and RMB-IO board, an operation log is taken and a trap is issued.

Table 2-9 The temperature surveillance threshold value for RMB-CPU and RMB-IO board

Threshold value name	Significance	Temperature threshold value
Caution for low temperature (caution)	Board temperature is lower than the operation guarantee temperature for this device.	2°C
Caution for high temperature (caution)	Board temperature is higher than the operation guarantee temperature for this device.	43°C
Warning for high temperature (critical)	Board temperature is lower than the operation guarantee temperature specified in NEBS (*1) level 3.	58°C
High temperature anomaly (fault)	Board temperature is higher than the absolute rated temperature.	65°C
*(*1) Network Equipment-Building System Requirements*		

2.4.12 Software

The enhanced models of the GR2000 (GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H, and GR2000-20H) use the same routing software called Routing Software 2 (ROUTE-OS2). The conventional models of GR2000 (GR2000-4, GR2000-10, and GR2000-20) use the same routing software called Routing Software (ROUTE-OS).

With GR2000-6H, GR2000-10H and GR2000-20H, IP-VPN function utilizing the MPLS function and MPLS can be used by applying the basic plus expansion software (Routing software3 : ROUTE-OS3) in place of ROUTE-OS2 or ROUTE-OS. This is in addition to the function provided by the common software (Routing software2: ROUTE-OS2) or (Routing software: ROUTE-OS). Moreover, in GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H and GR2000-20H, an IPv6 relay function can be used by applying basic + extended software 6 (routing software: ROUTE-OS6).

Embedded BSD/OS is used as an Internet server and kernel in the RM. Various protocol functions and commands are packaged as separate application processes to provide scalability. Included in the path control is the commercial version of GateD, which runs routing protocols such as OSPF and BGP4.

Figure 2-39 shows the composition and functions of the routing software.

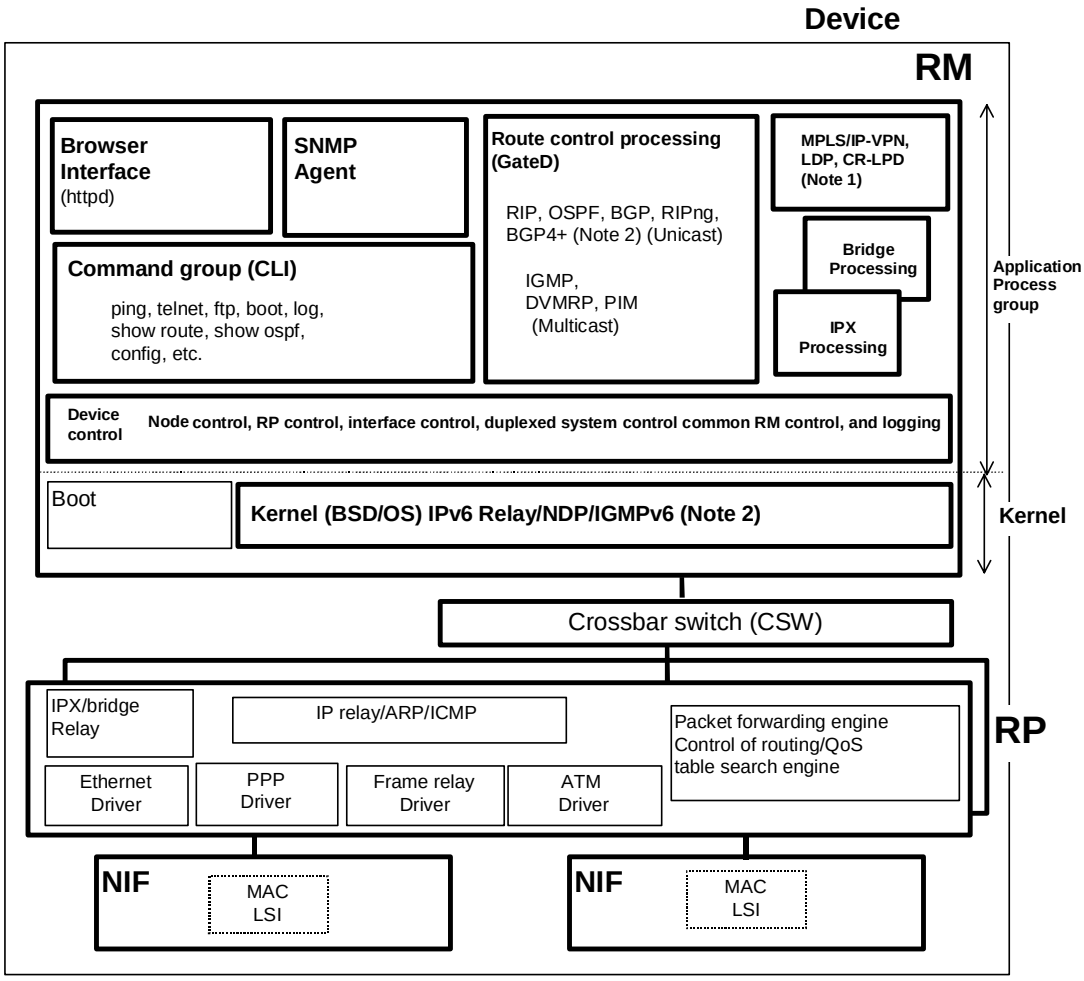


Figure 2-39 Routing Software Block Diagram

Note 1: Effective only when the basic plus expansion software3 (ROUTE-OS3) is applied.
Note 2: Effective only when the basic plus expansion software6 (ROUTE-OS6) is applied.

2.5 Connections

2.5.1 Interface Cables and Connectors

Most interface cables are customer responsibilities. Prepare appropriate interface cables with connectors, according to Table 2-10. Further explanation follows.

Table 2-10 Specifications of Interface Cables and Connectors

Physical Interface	NIF Name	Cable Specifications/Notes	Length (m)		Connector
			Min.	Max.	
10BASE-T	NE100-8T, NE100-8TA, NE100-8TB	UTP category 3/4/5, 4, 8-core, 2-pair straight	--	100	RJ-45
100BASE-TX	NE100-8T, NE100-8TA, NE100-8TB	UTP category 5, 8-core, 4-pair straight	--	100	RJ-45
100BASE-FX	NE100-4F	Multimode optical fiber of 62.5/125 μm core/clad, 1300 nm wavelength	2	2 k	SC 2-core
	NE100-4FS**	Single-mode optical fiber of 10/125 μm core/clad, 1300 nm wavelength	2	15 k	SC 2-core
	NE100-4FS4**	Single-mode optical fiber of 10/125 μm core/clad, 1300 nm wavelength	2	40 k	SC 2-core
1000BASE-SX	NE1G-1S, NE1G-1SA, NE1G-1SB NE1G-4C (GBIC-SX)	Multimode optical fiber of 50/125 mm core/clad, 850 nm wavelength, 500 MHz band	2	550	SC 2-core
		Multimode optical fiber of 62.5/125 μm core/clad, 1300 nm wavelength, 160 MHz band	2	220	SC 2-core
1000BASE-LX	NE1G-1L, NE1G-1LA, NE1G-1LB NE1G-4C (GBIC-SX)	Multimode optical fiber of 50/125 mm core/clad, 850 nm wavelength, 500 MHz band	2	550	SC 2-core
		Multimode optical fiber of 62.5/125 μm core/clad, 1300 nm wavelength, 160 MHz band	2	220	SC 2-core
		Single-mode optical fiber of 10/125 μm core/clad, 1300 nm wavelength	2	5 k	SC 2-core
1000BASE-LH	NE1G-1LHA**	Single-mode optical fiber of 10/125 μm core/clad, 1500 nm wavelength	2	40 k	SC 2core
	NE1G-1LHA8**	Single-mode optical fiber of 10/125 μm core/clad, 1500 nm wavelength	2	80 k	SC 2core
	NE1G-1LHBA**	Single-mode optical fiber of 10/125 μm core/clad, 1500 nm wavelength	2	100 k	SC 2core
	NE1G-4C (GBIC-LH)	Single-mode optical fiber of 10/125 μm core/clad, 1550 nm wavelength	2	70 k	SC 2core
V.24	NWVX-4 NWVX-8***	Special cable, 5 m standard	1	16	Device: 50-pin half-pitch, Channel: 25-pin D-sub
V.35	NWVX-4	Special cable, 5 m standard	1	16	Device: 50-pin half-pitch, Channel: 34-pin for V.35

Table 2-10 Specifications of Interface Cables and Connectors (continued)

Physical Interface	NIF Name	Cable Specifications/Notes	Length (m)		Connector
			Min.	Max.	
X.21	NWVX-4	Special cable, 5 m standard	1	16	Device: 50-pin half-pitch, Channel: 15-pin D-sub
Basic (I.430, I.430-a)	NWJB-8*, NWMX1-4**	UTP category 3/4/5, 4, 8-core, twisted-wire, straight (Japan only)	--	16	RJ-45
Primary (I.431, I.431-a)	NWJ1-4U*, NWJ1-8U*, NWMX1-4	UTP category 3/4/5, 4, 8-core, twisted-wire, straight (Japan only)	--	200	Device: IS8877, Channel: IS10173
Primary (G.703, ANSI T1.403)	NWT1-4, NWE1-8, NWE1-4	UTP category 3/4/5, 4, 8-core, twisted-wire, straight	--	1800	RJ-48
Secondary (G.703)	NWJ2-1U*	Metal (coax) 3C-2V	--	16	BNC
Tertiary (G.703)	NWT3-2U, NWE3-2U, NET3-1C, NWE3-1C	Metal (coax) 3C-2V, 3C-2W, RG-59 (Double sealed) (Note 1) (2) * Used only in Japan.	--	137	BNC
OC-3c/STM-1 (POS) MMF	NWOC3C-2M, NWOC3C-2MD, NWOC3C-8M	Multimode optical fiber of 50/125 or 62.5/125 mm core/clad	0.5	2 k	SC 2-core/1-core
OC-3c/STM-1 (POS) SMF	NWOC3C-2S, NWOC3C-2SD, NWOC3C-8S	Single-mode optical fiber of 10/125 µm core/clad	0.5	15 k	SC 2-core/1-core
OC-12c/STM-4 (POS) MMF	NWOC12C-4M	Single-mode optical fiber of 50/125 µm or 62.5/125µm core/clad	0.5	500	SC 2-core/1-core
OC-12c/STM-4 (POS) MMF	NWOC12C-1S, NWOC-12-1SD, NWOC12-4S	Single-mode optical fiber of 10/125 µm core/clad	0.5	15 k	SC 2-core/1-core
OC-48c/STM-16 (POS) SMF	NWOC48-1S	Single-mode optical fiber of 10/125 µm core/clad	0.5	2 k	SC 2-core/1-core
	NWOC48-1S4	Single-mode optical fiber of 10/125 µm core/clad	0.5	40 k	SC 2-core/1-core
	NWOC48-1S8	Single-mode optical fiber of 10/125 µm core/clad	0.5	80k	SC 2-core/1-core
	NWOC48-1A	Single-mode optical fiber of 10/125µm core/clad	0.5	2k	SC 2-core/1-core
	NWOC48-1A4	Single-mode optical fiber of 10/125 µm core/clad	0.5	40k	SC 2-core/1-core
	NWOC48-1A8	Single-mode optical fiber of 10/125 µm core/clad	0.5	80k	SC 2-core/1-core
OC-3c/STM-1 (ATM) MMF	NAOC3-1M, NAOC3-8M**	Multimode optical fiber of 50/125 or 62.5/125 mm core/clad	0.5	2 k	SC 2-core/1-core
OC-3c/STM-1 (ATM) SMF	NAOC3-1S NAOC3-8S**	Single-mode optical fiber of 10/125 µm core/clad	0.5	15 k	SC 2-core/1-core

Table 2-10 Specifications of Interface Cables and Connectors (continued)

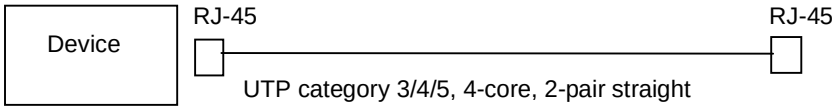
25Mbps ATM	NA25M-1*	UTP category 3/4/5, 4-core/8-core, 2-pair straight	--	90	RJ-45
OC-12c/STM-4 (ATM)MMF	NAOC12-2M**	Multimode optical fiber of 50/125 or 62.5/125 μm cre/clad	0.5	500	SC 2-core/1-core
OC-12c/STM-4 (ATM)SMF	NAOC12-2S**	Single-mode optical fiber of 10/125 μm cre/clad	0.5	1.5k	SC 2-core/1-core

** Used only in Japan.*
*** Pay attention to the tertiary group cable.*
**** Connect NWVX-8 with the cables supplied separately. For details, refer to "Facility plan" and "Hardware Operation Manual".*

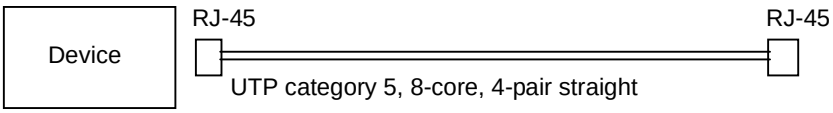
2.5.1.1 LAN

Illustrated below are the LAN interface cables and connectors. All these interface cables are to be procured by the customer.

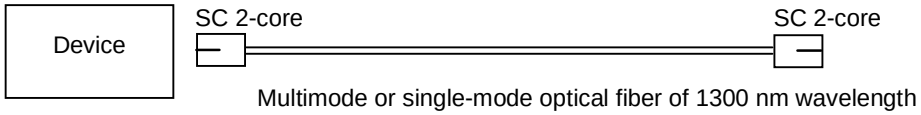
10BASE-T



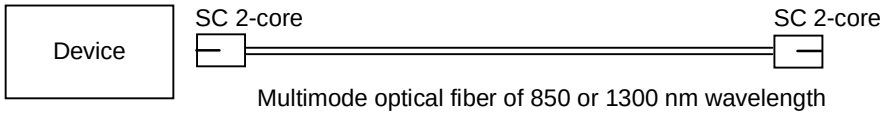
100BASE-TX



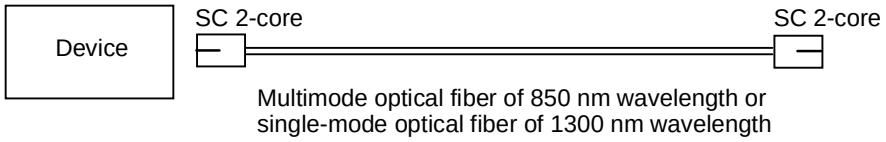
100BASE-FX



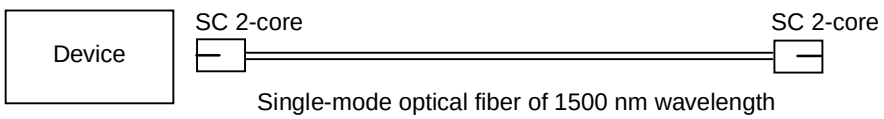
1000BASE-SX



1000BASE-LX


Device
SC 2-core
SC 2-core
Multimode optical fiber of 850 nm wavelength or
single-mode optical fiber of 1300 nm wavelength

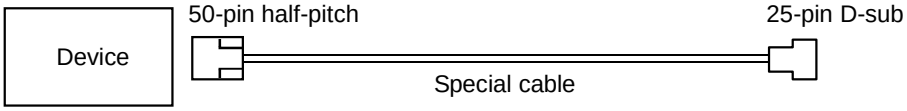
1000BASE-LH



2.5.1.2 WAN

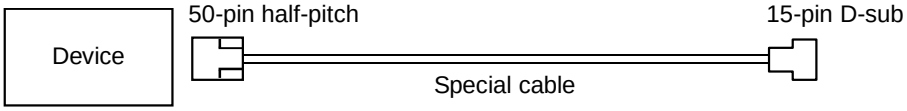
Only special interface cables for V.24/V.35/X.21 of the serial channel are supplied by the manufacturer. NIF modules share the same connector with V.24/V.35/X.21. Other interface cables are to be procured by the customer.

V.24

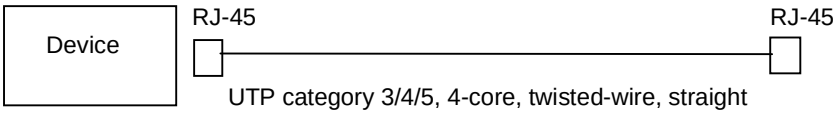


V.35

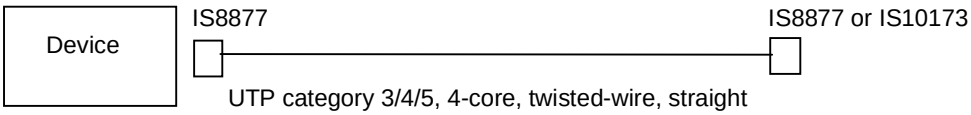
X.21



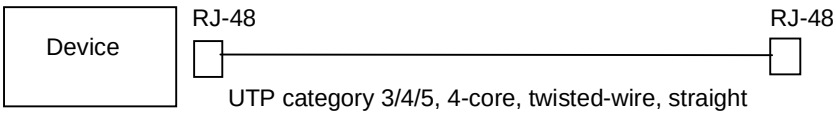
Basic (I.430, I.430-a) (Japan Only)



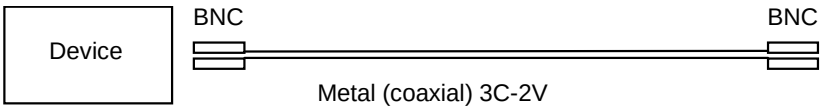
Primary (I.431, I.431-a) (Japan Only)



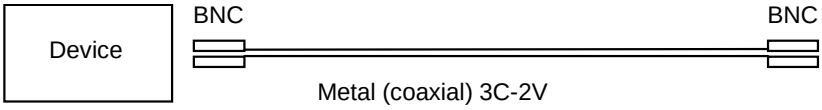
Primary (G.703, ANSI T1.403)



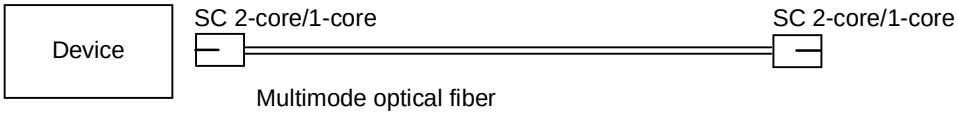
Secondary (G.703) (Japan Only)



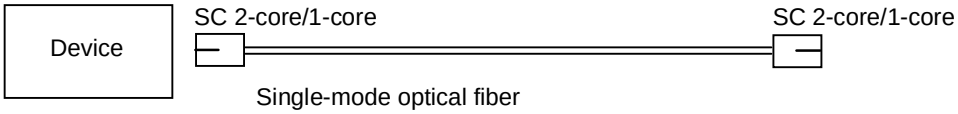
Tertiary (G.703, G.751)



OC-3c/STM-1 (150M) POS, OC-12c/STM-4 (600M) POS MMF



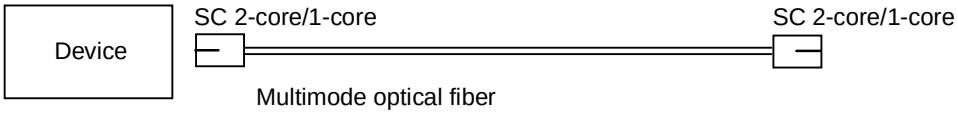
OC-3c/STM-1 (150M) POS, OC-12c/STM-4 (600M) POS, OC-48c/STM-16 (2.4G) POS SMF



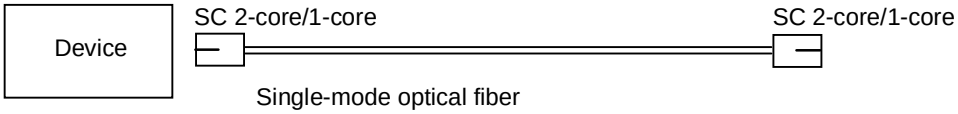
2.5.1.3 ATM

Illustrated below are the ATM interface cables and connectors. All these interface cables are to be procured by the customer.

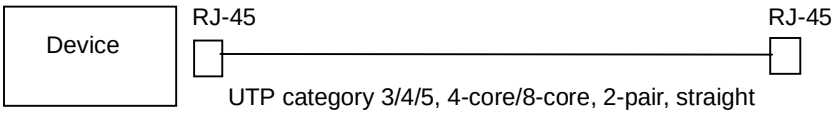
OC-3c/STM-1 (150M) ATM, OC-12c/STM-4 (600M) ATM MMF



OC-3c/STM-1 (150M) ATM, OC-12c/STM-4 (600M) ATM SMF



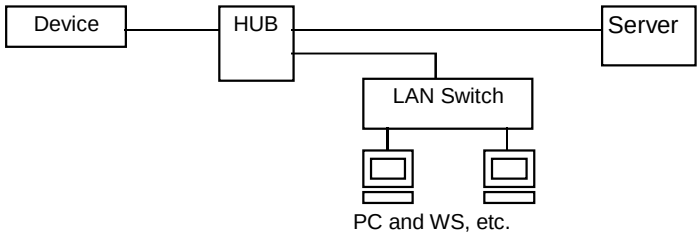
25Mbps ATM



2.5.2 Network Connections

2.5.2.1 LAN Connection

This device (router) connects to a server/terminal or a LAN switch via a hub.

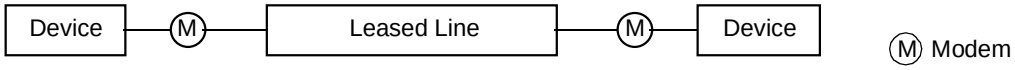


2.5.2.2 WAN Connection

The following WAN connections are possible:

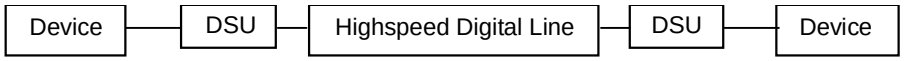
Leased line connection

Connects to a leased line via modem.



Highspeed digital line connection

Connects to a highspeed digital leased line via DSU.

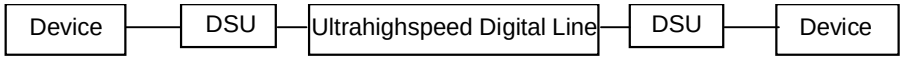


Frame relay network connection

Connects to a frame relay network via DSU.

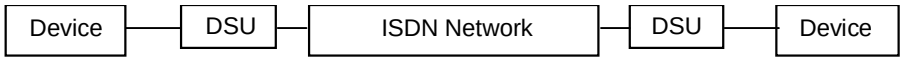
Ultrahighspeed digital line connection

Connects to a ultrahighspeed digital line via DSU.



ISDN Network Connection

Connects to an ISDN network via DSU.



2.5.2.3 ATM Connection

Connects to ATM Service via DSU/ONU.

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Chapter 3
Component Details

3.1 Cabinet (Chassis)

Table 3-1 shows the installed dimensions and the mass of each GR2000 cabinet model. The mass assumes the case when each cabinet model is installed with full options (maximum configuration). This table also refers to the minimum service clearance for maintaining or installing each cabinet model, differentiated by the type of installation (e.g., desktop, floor, and rack-mount). Figure 3-1 illustrates the minimum service clearance for desktop or floor installation, while Figure 3-2 illustrates the same for rack-mount installation (common among cabinet models). See Section Subsection 2.2 for the external images of these cabinet models.

Table 3-1 Installed Dimensions, Masses, and Minimum Service Clearances

Cabinet Model	Approx. Dimensions mm			Approx. Mass kg	Type of Installation and Minimum Service Clearance
	Height	Width	Depth		
GR2000-2S	90	440	480	15	• Desktop: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-4S	180	440	480	25	• Desktop: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-6H	360	440	480	50	• Desktop: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-10H	630	440	600	110	• Floor: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-20H	890	440	600	150	• Floor: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-4	130	440	600	25	• Desktop: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-10	750	430	600	85	• Floor: See Figure 3-1. • Rack-mount: See Figure 3-2.
GR2000-20	1450	440	600	190	• Floor: See Figure 3-1. • Rack-mount: See Figure 3-2.

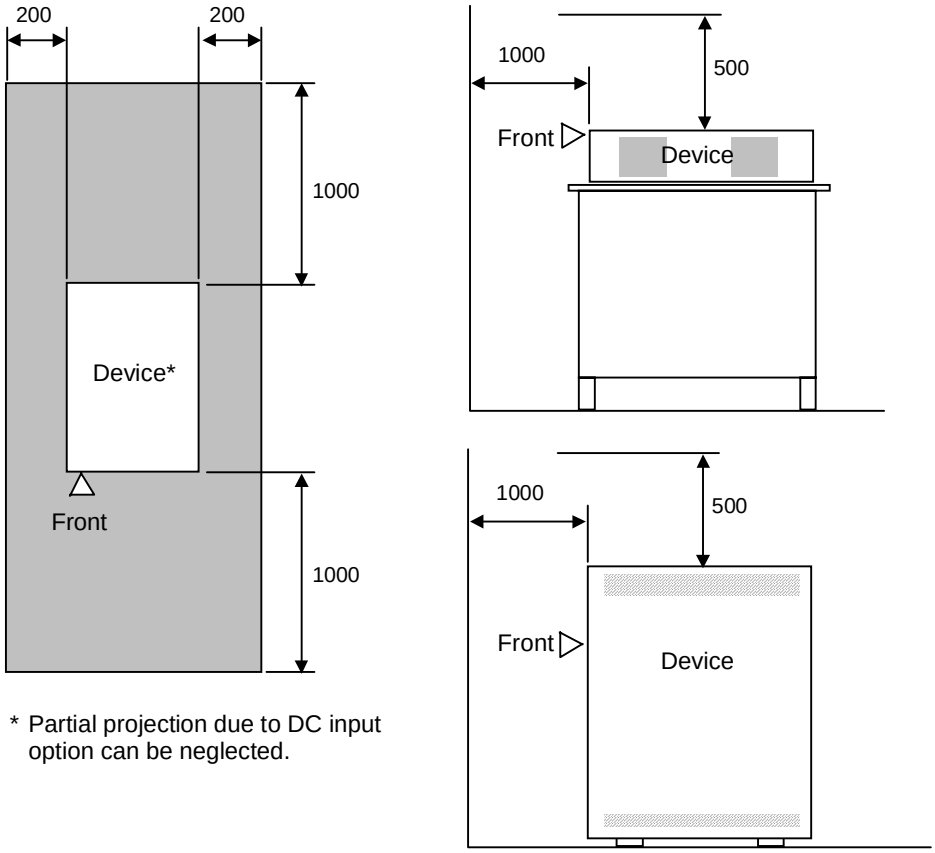


Figure 3-1 Minimum Service Clearance for Desktop or Floor Installation

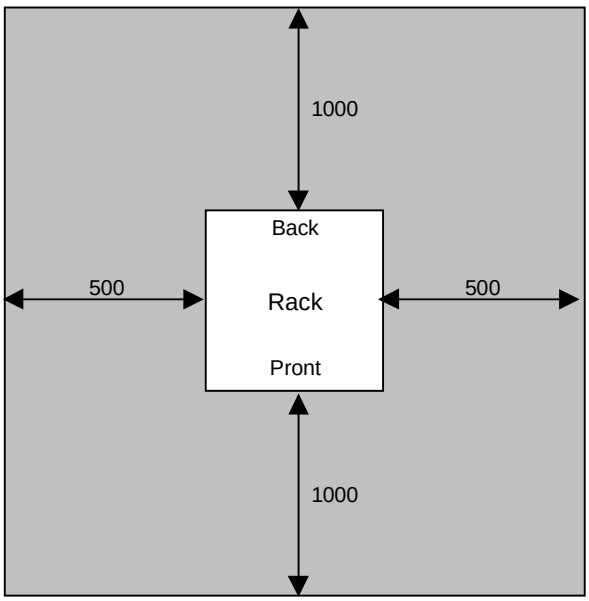
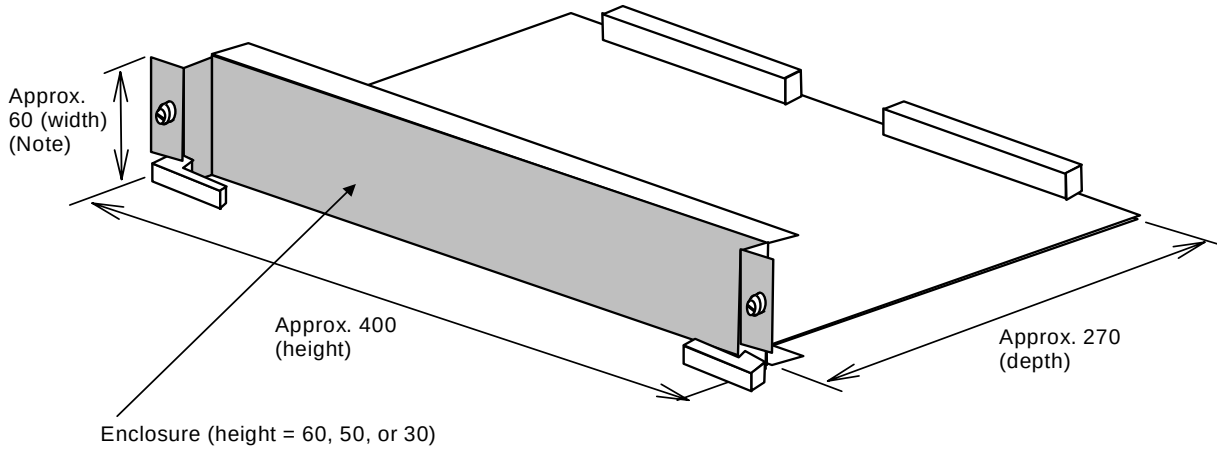


Figure 3-2 Minimum Service Clearance for Rack-Mount Installation (Top View)

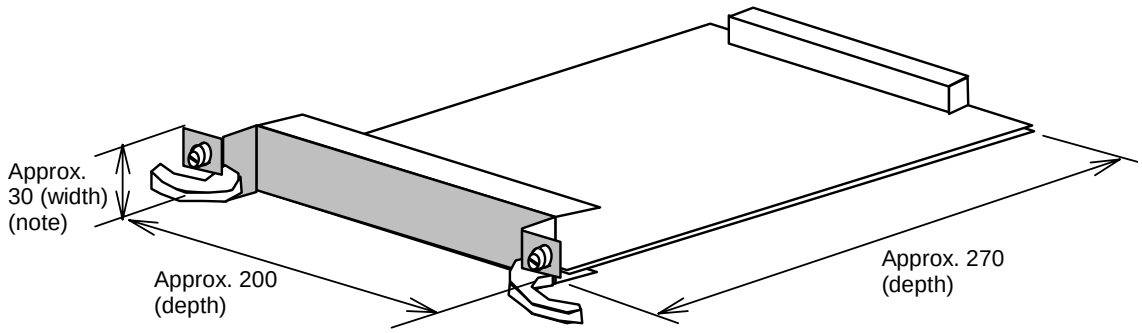
3.2 Module Characteristics

The BCU, RP, and NIF modules come in half-size, full-size, and special-size boards. See the figures below for the appearance of the half-size and full-size boards. Note that the connectors, display, etc. in the enclosure are different for each module. See Section 3.3, “Basic Control Unit (BCU), Section 3.4, “Routing Processor (RP) and Section 3.5, “Network Interface Module (NIF) for more detail on these modules.



Note: Measurements do not include handles. Units are in mm.

Figure 3-3 Full-Size Module



Note: Measurements do not include handles. Units are in mm.

Figure 3-4 Half-Size Module

3.3 Basic Control Unit (BCU)

The BCU comprises the modules listed in Table 3-2. Description of each board follows.

Table 3-2 BCU Components

Device Name	BCU Model Name	Subcomponent Board Name	Board Size
GR2000-2S	–	RM-CPU(2S)	Special size
		RMP	Full-size, 30mm-wide
GR2000-4S	BCU-S300S (BCU-S850S)	RM-CPU(4S) (RMB-CPU (4S))	Full-size, 50mm-wide
		RM-IO(4S) (RMB-IO (4S))	Full-size, 30mm-wide
GR2000-6H	BCU-H300H (BCU-H850H)	RM-CPU(HH) (RMB-CPU (HH))	Full-size, 50mm-wide
		RM-IO(H) (RMB-IO (H))	Full-size, 30mm-wide
GR2000-10H	BCU-M300H (BCU-M850H)	RM-CPU(MH) (RMB-CPU (MH))	Full-size, 60mm-wide
		RM-IO(H) (RMB-IO (H))	Full-size, 30mm-wide
GR2000-20H	BCU-L300H (BCU-L850H)	RM-CPU(LH) (RMB-CPU (LH))	Full-size, 50mm-wide
		RM-IO(H) (RMB-IO (H))	Full-size, 30mm-wide
	CSW-LH	CSW-L3MH	Special size
GR2000-4	BCU-S300	RM-CPU(S)	Full-size, 60mm-wide
		RM-IO(S)	Full-size, 30mm-wide
GR2000-10	BCU-M300	RM-CPU(M)	Full-size, 60mm-wide
		RM-IO(M)	Full-size, 60mm-wide
GR2000-20	BCU-L300	RM-CPU(L)	Full-size, 50mm-wide
		RM-IO(L)	Full-size, 50mm-wide
	CSW-L	CSW-L1M	Special size
		CSW-L3M	Special size

3.3.1 RM-CPU(2S)

The RM-CPU(2S) is incorporated in the GR2000-2S cabinet and physically appears as Figure 3-5.

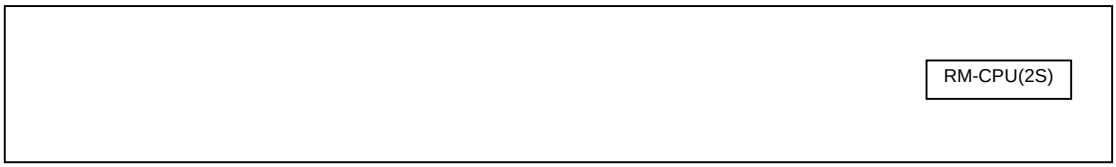


Figure 3-5 RM-CPU(2S) Front Panel View

3.3.2 RMP (2S)

The RMP is for GR2000-2S and physically appears as Figure 3-6.

The RMP has one CONSOLE (RS232C) port and four 10BASE-T/100BASE-TX ports. Table 3-4 and Table 3-5 show the connector specifications on these ports.

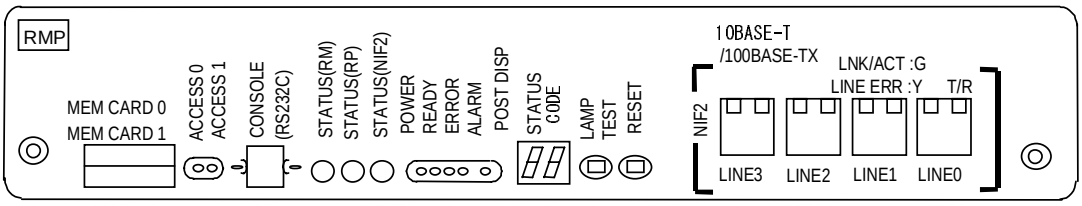


Figure 3-6 RMP Front Panel View

Switch and LED indication

Table 3-3 RMP switch and function of LED indications

Name of switch and LED	Switch or LED	Status	Content
STATUS (RM)	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow: Blocked Green blinking: Under preparation (being started up.) Red: Fault or shutdown Extinguished: Operation not possible (Including the device power supply being turned off)
POWER	LED: Green	Shows the state of power supply turned on or off.	Green: Voltages of 5V and 3.3V of RMP are normal. Extinguished: Voltages of 5V and 3.3V of RMP are not the specified voltage. (Fault in power supply unit or RMP board, or power supply switch in device is turned off, or AC power is not fed.)
READY	LED: Green	Shows the operable condition of the device.	Green: Operable operation Extinguished: Operation not possible (Including the device power supply being turned off)
ERROR	LED: Yellow	Shows partial fault in the device.	Yellow: Partial fault has been developed in the device. Extinguished: Occurrence of partial fault is not detected. (Including the device power supply being turned off.)
ALARM	LED: Red	Shows occurrence of fault in the device.	Red: Partial fault has occurred in the device. Extinguished: Operation possible. (Including the device power supply being turned off.)
POST DISP	LED: Green	Shows the state that STATUS CODE is indicating the initial diagnosis code of RM-CPU.	Green: Shows the state that STATUS CODE (7 seg) is indicating the initial diagnosis code of RM-CPU. Extinguished: Shows that STATUS CODE (7 seg) is indicating the contents of FAULT CODE. (Including the device power supply being turned off.)
STATUS CODE	7 seg for indicating the device condition.	7 seg. Decimal and two digits.	Green: Indicates the device state code for 00~99. (Code contents differ by lighting of POST DISP LED.) Extinguished: Non-indication. (Including the device power supply being turned off.)
ACCESSO	LED: Green	Shows the state of MC card being zero.	Blinking: MC card zero being accessed. (Memory card take-out is prohibited.) Extinguished: MC card zero being idle. (Memory card may be put in or taken out.)
ACCESS 1	LED: Green	Shows the state of MC card being one.	Blinking: MC card one being accessed. (Memory card take-out is prohibited.) Extinguished: MC card one being idle. (Memory card may be put in or taken out.)
STATUS (RP)	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow: Blocked Green blinking: Under preparation (being started up.) Red: Fault or shutdown Extinguished: Operation not possible (Including the device power supply being turned off.)
STATUS (NIFE)	LED: Green/ Yellow/ Red	Shows the operating condition of XIF2 (built-in Ethernet).	Green: Operable operation Yellow: Blocked Green blinking: Under preparation (being started up.) Red: Fault or shutdown Extinguished: Operation not possible (Including the device power supply being turned off)
LNK/ACT	LED: Green		Green: Ring pulse of 10BASE-T or 100BASE-TX is being established.

Table 3-3 RMP switch and function of LED indications

Name of switch and LED	Switch or LED	Status	Content
LINE ERR	LED: Yellow	Shows the operating condition of each line.	Yellow: Line section II/W fault detection.
T/R	LED: Green		Conditions of transmission and reception signals.
LAMP TEST	Switch (Non-Lock)	Lamp test	Press: LED's on all the boards are lit.
REST	Switch (Non-Lock)	Manual resetting the device	Reset.

Table 3-4 Specifications of 9-pin D-sub Connector on CONSOLE (RS232C) Port

Pin No.	Specifications
7	Request to send (RS) output
8	Clear to send (CS) input
6	Data set ready (DR) input
4	Data terminal ready (ER) output
1	Carrier detect of data channel receive (CD) input
9	Called indicator (CI) input
5	Signal ground or common line (SG)
3	Send data (SD) output
2	Receive data (RD) input

Table 3-5 Specifications of 8-pin RJ45 Connector on 10BASE-T/100BASE-TX Port

Pin No.	Specifications
1	Transmit (+) (TA)
2	Transmit (-) (TB)
3	Receive (+) (RA)
4	Unused (UA)
5	Unused (UB)
6	Receive (-) (RB)
7	Unused (UC)
8	Unused (UD)

Note: Because the interface cable is of twisted-pair type, make TA and TB into a pair, and make RA and RB into another pair on 10BASE-T; the other pins can be connected to one another without particular regard to pairing, or can be left open. On 100BASE-TX, additionally make UA and UB into a pair, and make UC and UD into another pair to cause termination within the RMP.

3.3.3 RM-CPU(4S), RMB-CPU (4S), RM-CPU(HH), RMB-CPU (HH), RM-CPU(MH), RMB-CPU (MH), RM-CPU(LH) and RMB-CPU (LH)

The RM-CPU(4S) and RMB-CPU (4S) for GR2000-4S, the RM-CPU(HH) and RMB-CPU (HH) for GR2000-6H, the RM-CPU(MH) and RMB-CPU (MH) for GR2000-10H, and the RM-CPU(LH) and RMB-CPU (LH) for GR2000-20H physically appear as Figure 3-7 through Figure 3-9.

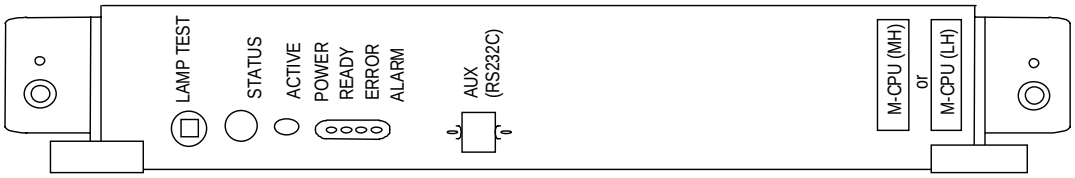
The RM-CPU(4S), the RMB-CPU (4S), the RM-CPU(HH) RMB-CPU (HH), the RM-CPU(MH) RMB-CPU (MH), and the RM-CPU(LH) RMB-CPU (LH) each have one AUX (RS232C) port for the console connection. Table 3-5 shows the connector specifications on this port.

Note: AUX not used in case of RMB-CPU (4S).

Figure 3-7 RM-CPU(4S), RMB-CPU (4S) Front Panel View

Note: AUX not used in case of RMB-CPU (HH).

Figure 3-8 RM-CPU(HH) RMB-CPU (HH) Front Panel View



Note: AUX not used in case of RMB-CPU (MH) and RBM-CPU(LH).

Figure 3-9 RM-CPU(MH) RMB-CPU (MH) or RM-CPU(LH) RMB-CPU (LH) Front Panel View (GR2000-10H/20H)

Switch and LED indication

Table 3-6 RM-CPU switch and function of LED indications

Name of switch and LED	Switch or LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow : Blocking and the board replaceable state. Green blinking: Under preparation (Program being loaded.) Red: Fault or shutdown Extinguished: Operation not possible (Including the device power supply being turned off)
ACTIVE	LED: Green	Shows the operating/standby condition of duplicated basic control mechanism.	Green: Shows the state of operation. (Lights up continuously when not duplicated.) Extinguished: Shows the standby state. (Including the device power supply being turned off.)
POWER	LED: Green	Shows the state of power supply turned on or off.	Green: Voltages of 5V and 3.3V of RMP are normal. Extinguished: Voltages of 5V and 3.3V of RMP are not the specified voltage. (Fault in power supply unit or RMP board, or power supply switch in device is turned off, or AC power is not fed.)
READY	LED: Green	Shows the operable condition of the device.	Green blinking: Operable operation Extinguished: Operation not possible (Including the device power supply being turned off)
ERROR	LED: Yellow	Shows partial fault in the device.	Yellow: Partial fault has been developed in the device. Extinguished: Occurrence of partial fault is not detected. (Including the device power supply being turned off.
ALARM	LED: Red	Shows occurrence of fault in the device.	Red blinking: Partial fault has occurred in the device. Extinguished: Operation possible. (Including the device power supply being turned off.
LAMP TEST	Switch (Non-Lock)	LED test	Press: LED's on all the boards are lit.

Table 3-7 Specifications of 9-pin D-sub Connector on AUX (RS232C) Port

Pin No.	Specifications
7	Request to send (RS) output
8	Clear to send (CS) input
6	Data set ready (DR) input
4	Data terminal ready (ER) output
1	Carrier detect of data channel receive (CD) input
9	Called indicator (CI) input
5	Signal ground or common line (SG)
3	Send data (SD) output
2	Receive data (RD) input

3.3.4 RM-CPU(S), RM-CPU(M), RM-CPU(MC2) and RM-CPU(L)

The RM-CPU(S) for GR2000-4, the RM-CPU(M) for GR2000-10, and the RM-CPU(L) for GR2000-20 physically appear as Figure 3-10 and Figure 3-11.

Figure 3-10 RM-CPU(S) Front Panel View

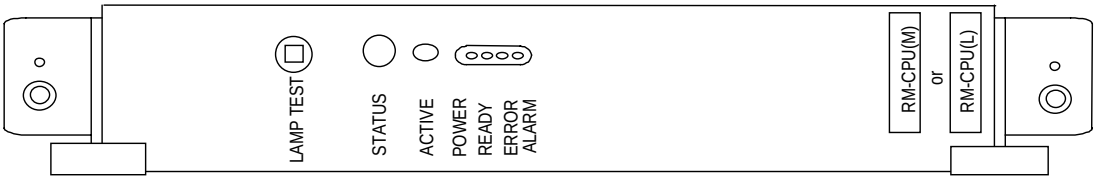


Figure 3-11 RM-CPU(M), RM-CPU(MC2) and RM-CPU(L) Front Panel View

3.3.5 RM-IO(4S), RMB-IO (4S) and RM-IO(H)

The RM-IO(4S) for GR2000-4S, the RMB-IO (4S) for GR2000-4S (BCU-S850S) and the RM-IO(H) for GR2000-6H, GR2000-10H, and GR2000-20H physically appear as Figure 3-12 and Figure 3-14.

The RM-IO(4S), RMB-IO (4S) and the RM-IO(H) each have one CONSOLE (RS232C) port and one CONSOLE (10BASE-T/100BASE-TX) port. Table 3-9 and Table 3-10 show the connector specifications on these ports.

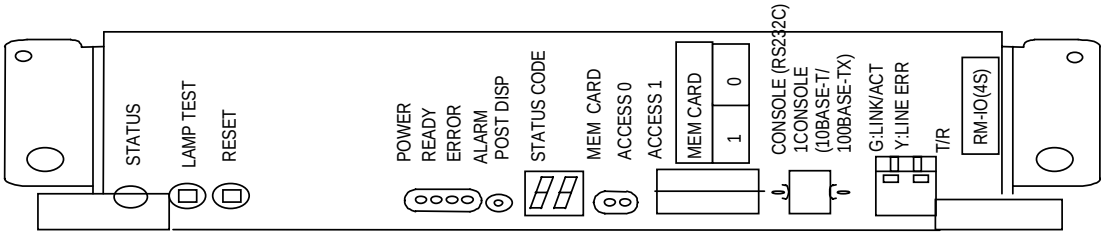


Figure 3-12 RM-IO(4S) Front Panel View

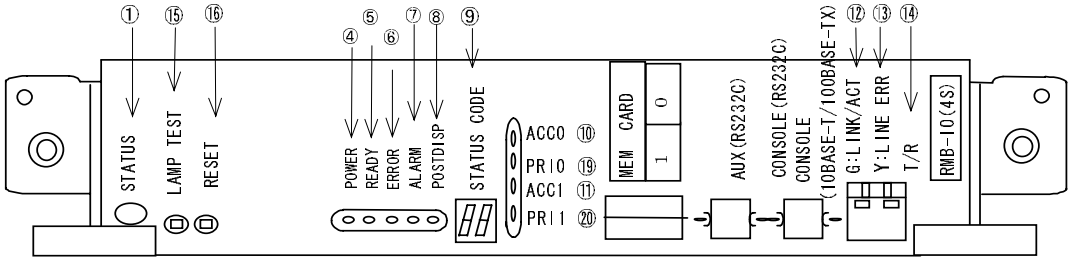


Figure 3-13 RMB-IO(4S) Front Panel View

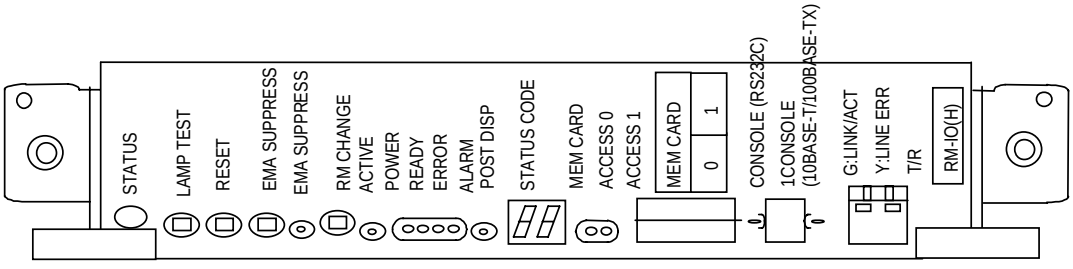


Figure 3-14 RM-IO(H) Front Panel View

Switch and LED indication

Table 3-8 RM-IO switch and function of LED indications

Name of switch and LED	Switch or LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow: Blocking and cock insertion and removal possible. Green blinking: Under preparation (being started up.) Red: Fault or shutdown Extinguished: Operation not possible (Including the device power supply being turned off)
EMA SUPPRESS (GR2000-4S)	LED: Yellow	Shows the state of EMA SUPPRESS key, and the system switching suppression state.	Yellow: If both of the operation and standby systems or only the operation system are lit, it shows that the system is in switching suppression state according to the instructions of turning the operation system EMA SUPPRESS switch on or EMA SUPPRESS by means of software. If only the standby system is lit, since it shows that the EMA SUPPRESS switch of the standby system is turned on, keep the switch turned off. In this case, the system switching is not suppressed. Extinguished: Shows that it is not in the system switching suppression state. (Including the device power supply being turned off.)
ACTIVE (GR2000-4S)	LED: Green	Shows the state of operation/standby of the duplicated section.	Green: Shows the state of operation. (Lights up continuously when not duplicated.) Extinguished: Shows the standby state. (Including the device power supply being turned off.)
POWER	LED: Green	Shows the state of power supply turned on or off.	Green: Voltages of 5V and 3.3V of RMP are normal. Extinguished: Voltages of 5V and 3.3V of RMP are not the specified voltage. (Fault in power supply unit or RMP board, or power supply switch in device is turned off, or AC power is not fed.)
READY	LED: Green	Shows the operable condition of the device.	Green blinking: Operable operation Extinguished: Operation not possible (Including the device power supply being turned off)
ERROR	LED: Yellow	Shows partial fault in the device.	Yellow: Partial fault has been developed in the device. Extinguished: Occurrence of partial fault is not detected. (Including the device power supply being turned off.)
ALARM	LED: Red	Shows occurrence of fault in the device.	Red: Partial fault has occurred in the device. Extinguished: Operation possible. (Including the device power supply being turned off.)
POST DISP	LED: Green	Shows the state that STATUS CODE is indicating the initial diagnosis code of RM-CPU.	Green blinking: Shows the state that STATUS CODE (7 seg) is indicating the initial diagnosis code of RM-CPU. Extinguished: Shows that STATUS CODE (7 seg) is indicating the contents of FAULT CODE. (Including the device power supply being turned off.)
STATUS CODE	7seg: Green	7 seg for indicating the device condition. 7 seg. Decimal and two digits.	Green blinking: Indicates the device state code for 00~99. (Code contents differ by lighting of POST DISP LED.) Extinguished: Non-indication. (Including the device power supply being turned off.)
ACCESS 0	LED: Green	Shows the state of MC card being zero.	Blinking: MC card zero being accessed. (Memory card take-out is prohibited.) Extinguished: MC card zero being idle. (Memory card may be put in or taken out.)

Table 3-8 RM-IO switch and function of LED indications

Name of switch and LED	Switch or LED	Status	Content
ACCESS 1	LED: Green	Shows the state of MC card being one.	Blinking: MC card one being accessed. (Memory card take-out is prohibited.) Extinguished: MC card one being idle. (Memory card may be put in or taken out.)
LINK/ACT	LED: Green	Shows the ring state of RM Ethernet connection port.	Green: Ring pulse being established.
LINE ERR	LED: Yellow	Shows the fault occurrence in the RM Ethernet connection port.	Yellow: Line fault detection.
T/R	LED: Green	Shows the contents of data transmission and reception of the RM Ethernet connection port.	Conditions of transmission and reception signals.
LAMP TEST	Switch (Non-lock)	Lamp test	Press: LED's on all the boards are lit.
RESET	Switch (Non-lock)	Stops the function of the system switching circuit.	Reset
EMA SUPRESS (GR2000-4S)	Switch (Lock)	Stops the function of the system switching circuit.	Suppresses the operation/standby system switching circuit of the duplicated basic control mechanism. Do not turn this switch on during normal operation. If the switch for the operation system is turned on, EMA SUPPRESS LED's in both systems are lit yellow. If the switch for the standby system is turned on, only the EMA SUPPRESS LED in the standby systems is lit yellow. Even if either switch is turned on, the system switching is suppressed.
RM CHANGE (GR2000-4S)	Switch		Press: The operation/standby of the duplicated basic control mechanism is changed over.

Table 3-9 Specifications of 9-pin D-sub Connector on CONSOLE (RS232C) Port

Pin No.	Specifications
7	Request to send (RS) output
8	Clear to send (CS) input
6	Data set ready (DR) input
4	Data terminal ready (ER) output
1	Carrier detect of data channel receive (CD) input
9	Called indicator (CI) input
5	Signal ground or common line (SG)
3	Send data (SD) output
2	Receive data (RD) input

Table 3-10 Specifications of 8-pin RJ45 Connector on CONSOLE (10BASE-T/ 100BASE-TX) Port

Pin No.	Specifications
1	Transmit (+) (TA)
2	Transmit (-) (TB)
3	Receive (+) (RA)
4	--
5	--
6	Receive (-) (RB)
7	--
8	--

3.3.6 RM-IO(S), RM-IO(M), and RM-IO(L)

The RM-IO(S) for GR2000-4, the RM-IO(M) for GR2000-10, and the RM-IO(L) for GR2000-20 physically appear as Figure 3-12 and Figure 3-14.

The RM-IO(S), RM-IO (M) and the RM-IO(L) each has one CONSOLE (RS232C) port and one CONSOLE (10BASE-T/100BASE-TX) port. The connector specifications on these ports are the same as those for the RM-IO(4S) or RM-IO(H) defined in the preceding subsection.

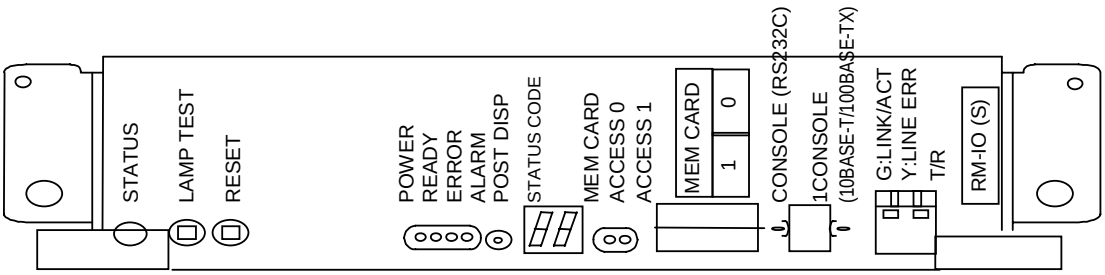


Figure 3-15 RM-IO(S) Front Panel View

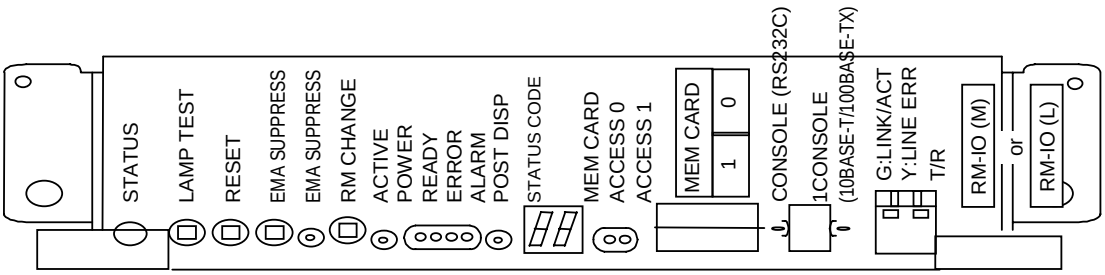


Figure 3-16 RM-IO(M) and RM-IO(L) Front Panel View

3.3.7 RMB-IO(H)

The RMB-IO(H) for GR2000-6H, GR2000-10H and GR2000-20H (BCU-H850H, BCU-M850H and BCU-L850H) physically appears as Figure 3-17

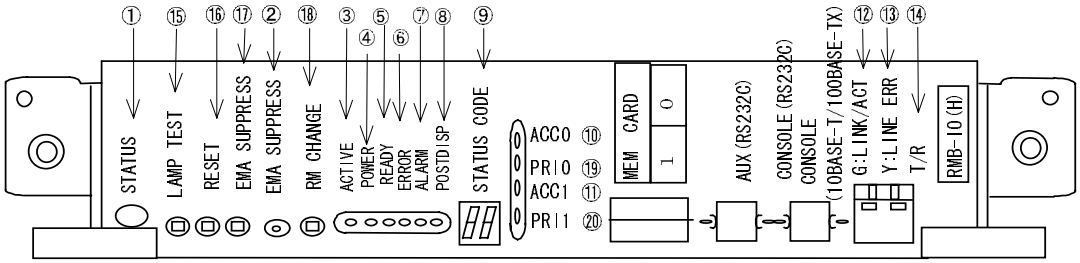


Figure 3-17 RMB-IO(H) Front Panel View

3.3.8 CSW

The CSW-L3MH for GR2000-20H, and the CSW-L1M and the CSW-L3M for GR2000-20 physically appear as Figure 3-18 and Figure 3-19. To explore the LED display functions, see the *Operations Guide*.

Figure 3-18 CSW-L3MH Front Panel View

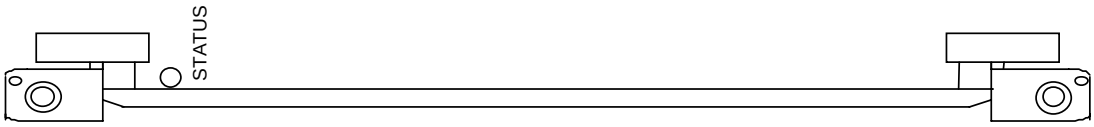


Figure 3-19 CSW-L1M and CSW-L3M Front Panel View

Switch and LED indication

Table 3-11 BCU switch and function of LED indications

Nam of Board	Name of switch and LED	Switch or LED	Status	Content
CSW	STATUS (GR2000-4/10)	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow: Blocking and cock insertion and removal possible. Green blinking: Under preparation (being started up.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)

3.4 Routing Processor (RP)

Three types of RP models, RP-A1 (standard), and RP-C/C6 and RP-D/D6 (options for highspeed media), apply to the GR2000 device models as listed in Table 3-12. Each RP model comprises one RP board. Description of each RP board follows.

Table 3-12 RP Models

RP Model Name	Board Size	Applicable Device Model
RP-A1	Full-size, 30mm-wide	GR2000-4S, GR2000-6H, GR2000-10H, GR2000-20H, GR2000-4, GR2000-10, and GR2000-20
RP-C/C6	Full-size, 30mm-wide	GR2000-6H, GR2000-10*, GR2000-10H*, GR2000-20H*, and GR2000-20*
RP-D/D6	Full-size, 30mm-wide	GR2000-4S** GR2000-6H, GR2000-10, GR2000-10H, GR2000-20H, and GR2000-20
** Use of RP-C sometimes limits configuration of these models. For details, see Section 4.2, "Configuration Limits."* *** The MPLS or MPLS-based IP-VPN feature is not available for use with the GR2000-4S.*		

3.4.1 RP-A1/RP-D/RP-D6

The RP-A1 physically appears as Figure 3-20. To explore the switch and LED display functions, see the *Operations Guide*.

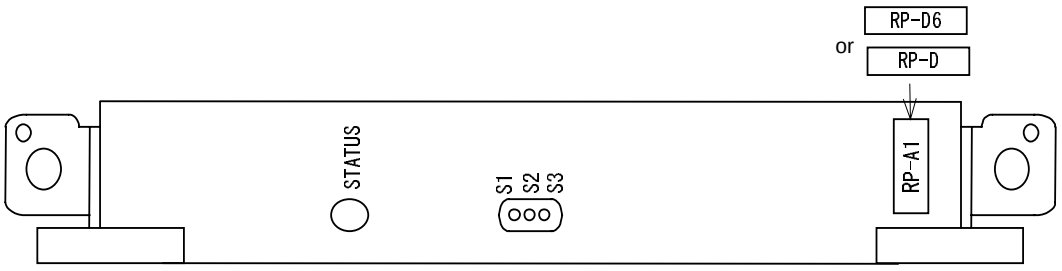


Figure 3-20 RP-A1/RP-D/RP-D6 Front Panel View

Switch and LED indication

Table 3-13 BCU switch and function of LED indications

Nam	Name of switch and LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RP.	Green: Operable operation Yellow: Blocking and cock insertion and removal possible. Green blinking: Under preparation (being started up.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)
S1	LED: Green		Don't care
S2	LED: Green		Don't care
S3	LED: Green		Don't care

3.4.2 RP-C/RP-C6

The RP-C and RP-C6physically appear as Figure 3-21. The switch, LED display functions of the RP-C and RP-C6 are the same as those of the RP-A1. The additional LEDs are for test purposes only.

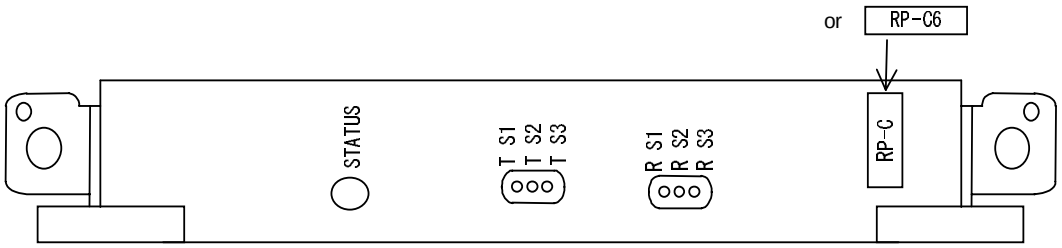


Figure 3-21 RP-C/C6 Front Panel View

Switch and LED indication

Table 3-14 RP-C/RP-C6 switch and function of LED indications

Nam	Name of switch and LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RP.	Green: Operable operation Yellow: Blocking and cock insertion and removal possible. Green blinking: Under preparation (being started up.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)
S1	LED: Green		Don’t care
S2	LED: Green		Don’t care
S3	LED: Green		Don’t care
S1	LED: Green		Don’t care
S2	LED: Green		Don’t care
S3	LED: Green		Don’t care

3.5 Network Interface Module (NIF)

Various types of NIF models are provided as listed in Table 3-15. Each NIF model comprises one NIF board. Description of each NIF board follows.

Table 3-15 NIF Models

Category	Physical Interface	NIF Name	Board Size	Remarks
LAN	10BASE-T, 100BASE-TX	NE100-8T	Half size, 30mm wide	100m
		NE100-8TA	Half size, 30mm wide	VRRP, MPLS support, 100m
	100BASE-FX	NE100-4F	Half size, 30mm wide	MMF, 2km
		NE100-4FS**	Half size, 30mm wide	SMF middle distance, 15km
		NE100-4FS4**	Half size, 30mm wide	SMF long distance, 40km
	1000BASE-SX	NE1G-1S	Full size, 30mm wide	550m
		NE1G-1SA	Full size, 30mm wide	VRRP, MPLS support, 550m
		NE1G-1SB	Full size	VRRP, MPLS, VLAN, Bandwidth control support, 550m
	1000BASE-LX	NE1G-1L	Full size, 30mm wide	550m
		NE1G-1LA	Full size, 30mm wide	VRRP, MPLS support, 550m
		NE1G-1LB	Full size	VRRP, MPLS, VLAN, Bandwidth control support, 550m
		NE1G-4C	Full size, 30mm wide	GBIC Support, VRRP, MPLS, VLAN, Bandwidth control support
	1000BASE-LH	NE1G-1LHA**	Full size, 30mm wide	40km
		NE1G-1LHA8**	Full size, 30mm wide	80 km support
		NE1G-1LHBA**	Full size, 30mm wide	100km
WAN	V.24/V.35/X.21	NWVX-4	Half size, 30mm wide	16m
	Highspeed digital	NWJB-8*	Half size, 30mm wide	Basic, Japan only, 16m
		NWJ1-4U*	Half size, 30mm wide	Primary, Japan only, 200m
		NWJ1-8U*	Half size, 30mm wide	Primary, Japan only, 200m
		NWMX1-4*	Half size, 30mm wide	Basic+primary, Japan only, 200m
		NWT1-4	Half size, 30mm wide	Primary, North America, 1800m
		NWE1-4	Half size, 30mm wide	Primary, Europe, Asia, 1800m
		NWE1-8	Halfsize, 30mm wide	MPLS support
		NWJ2-1U*	Half size, 30mm wide	Secondary, Japan only, 16m
		NWT3-2U	Half size, 30mm wide	Tertiary, North America, 137m
		NWE3-1C	Half size, 30mm wide	34 MB Multiplexed, 137m
		NWE3-2U	Half size, 30mm wide	Tertiary, Europe, 137m
	OC-3c/STM-1 (POS)	NWOC3C-2M	Half size, 30mm wide	MMF, 2km
		NWOC3C-2S	Half size, 30mm wide	SMF, 15km
		NWOC3C-2MD	Half size, 30mm wide	MPLS support, 2km
		NWOC3C-8M	Full size, 30mm wide	2km
		NWOC3C-2SD	Half size, 30mm wide	MPLS support, 15km
		NWOC3C-8S	Full size, 30mm wide	15km
	OC-12c/STM-4 (POS)	NWOC12C-1S	Full size, 30mm wide	15km
		NWOC12-4M	Full size, 30mm wide	500m
		NWOC12-1SD	Full size, 30mm wide	MPLS supoort, 15km
		NWOC12-4S	Full size, 30mm wide	15 km

Table 3-15 NIF Models (continued)

	OC-48c/STM-16 (POS)	NWOC48-1S	Full size, 30mm wide	2 km
		NWOC48-1S4	Full size, 30mm wide	40 km
		NWOC48-1S8	Full size, 30mm wide	80 km
		NWOC48-1A	Full size, 30mm wide	2km
		NWOC48-1A4	Full size, 30mm wide	40km
		NWOC48-1A8	Full size, 30mm wide	80km
ATM	OC-3c/STM-1 (ATM)	NAOC3-1M	Half size, 30mm wide	MMF, 2km
	OC-3c/STM-1 (ATM)	NAOC3-1S	Half size, 30mm wide	SMF, 15km
	25Mbps ATM	NA25M-1	Half size, 30mm wide	90m
	OC-12c/STM-4 (ATM)	NAOC12-2M	Full size, 30mm wide	MMF, 500m
	OC-12c/STM-4 (ATM)	NAOC12-2S	Full size, 30mm wide	SMF, 15km
		NAOC3-8M**	Full size, 30mm wide	2km
		NAOC3-8S**	Full size, 30mm wide	15km

**For Japan only*
*** Product intended for the Japanese market handled only by Hitachi Japan.*

3.5.1 NE100-8T, NE100-8TA and NE100-8TB

The NE100-8T, NE100-8TA, and NE100-8TB physically appear as Figure 3-22. These NIFs each have eight ports for connection with 8-pin modular connectors of RJ-45. Table 3-16 shows the connector specifications.

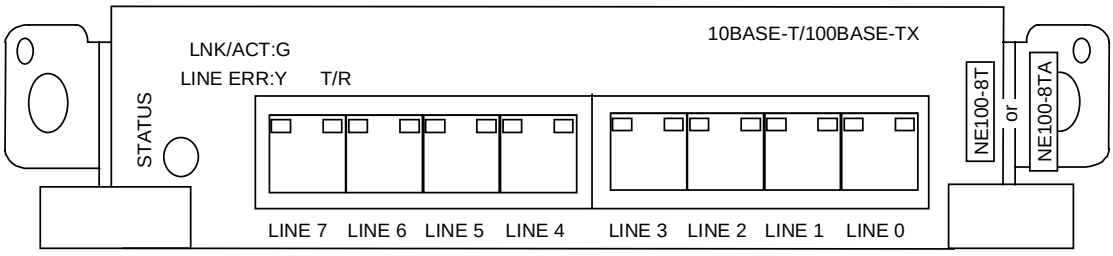


Figure 3-22 NE100-8T, NE100-8TA and NE100-8TB Front Panel View

Table 3-16 Connector Specifications for NE100-8T, NE100-8TA and NE100-8TB

Pin No.	Specifications
1	Transmit (+) (TA)
2	Transmit (-) (TB)
3	Receive (+) (RA)
4	Unused (UA)
5	Unused (UB)
6	Receive (-) (RB)
7	Unused (UC)
8	Unused (UD)

Note: Because the interface cable is of twisted-pair type, make TA and TB into a pair, and make RA and RB into another pair on 10BASE-T; the other pins can be connected to one another without particular regard to pairing, or can be left open. On 100BASE-TX, additionally make UA and UB into a pair, and make UC and UD into another pair to cause termination within the NIF.

3.5.2 NE100-4F, NE100-4FS, and NE100-4FS4

The NE100-4F, NE100-4FS, and NE100-4FS4 physically appear as Figure 3-23.

These NIFs each have four ports for connection with pairs of SC 2-core optical fiber connectors (transmit and receive). Table 3-18 shows the connector specifications.

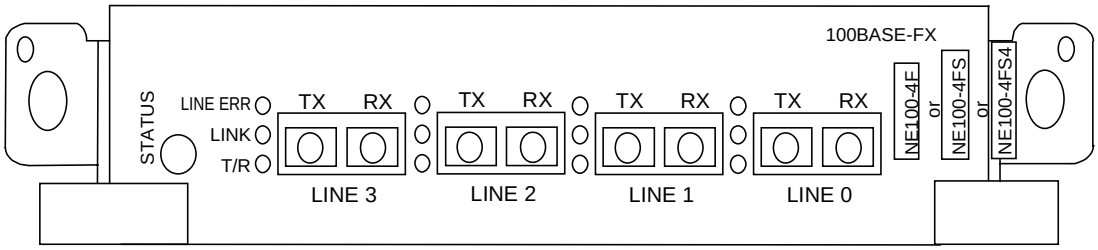


Figure 3-23 NE100-4F, NE100-4FS, and NE100-4FS4 Front Panel View

Switch and LED indication

Table 3-17 NE100-4F/NE100-4FS/NE100-4FS4 switch and function of LED indications

Nam	Name of switch and LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RP.	Green: Operable operation Yellow: Blocking and cock insertion and removal possible. Green blinking: Under preparation (being started up.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)
LINK	LED: Green	Shows the operating condition of each line.	Ring pulse of 100BASE-FX/FX (middle)/FX (long) is being established.
LINE ERR	LED: Red		
T/R	LED: Green		

Table 3-18 Connector Specifications for NE100-4F, NE100-4FS, and NE100-4FS4

NIF	Connector Specifications
NE100-4F	SC 2-core (flat) connector (multimode fiber, 1300 nm wavelength)
NE100-4FS	SC 2-core (flat) connector (single-mode fiber, 1300 nm wavelength)
NE100-4FS4	SC 2-core (flat) connector (single-mode fiber, 1300 nm wavelength)

3.5.3 NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1LB, NE1G-1SB and NE1G-1LHBA

The NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1LB, NE1G-1SB and NE1G-1LHBA physically appear as Figure 3-24.

These NIFs each have one port for connection with a pair of SC 2-core optical fiber connectors (transmit and receive). Table 3-20 shows the connector specifications.

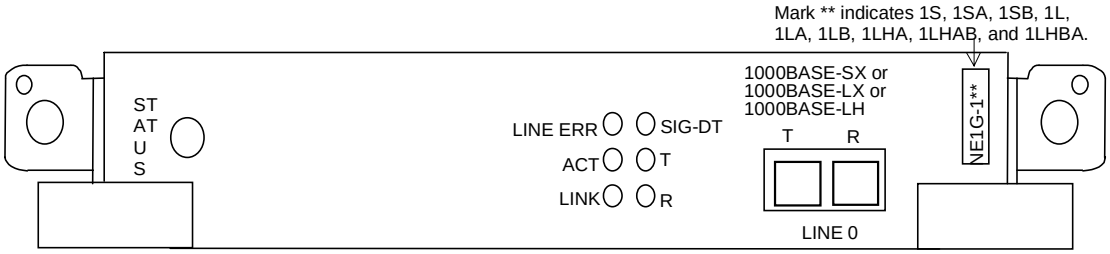


Figure 3-24 NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1SB, NE1G-1LB and NE1G-1LHBA Front Panel View

Switch and LED indication

Table 3-19 NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1LB, NE1G-1SB and NE1G-1LHBA switch and function of LED indications

Name	Name of switch and LED	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of RM.	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program being loaded.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)
LINE	LED: Green		Green: Ring pulse being established
ACT	LED: Green	Shows the operating condition of each line.	Green: Line operation possible state (line open state)
LINE ERR	LED: Yellow		Yellow: Line section II/W fault detection.
R	LED: Green		Frame signal being received.
T	LED: Green		Frame signal being transmitted.
SIG-DT	LED: Green		Signal detect operation detected.

Table 3-20 Connector Specifications for NE1G-1S, NE1G-1SA, NE1G-1L, NE1G-1LA, NE1G-1LHA, NE1G-1LHA8, NE1G-1SB, NE1G-1LB and NE1G-1LHBA

NIF	Connector Specifications
NE1G-1S, NE1G-1SA, NE1G-1SB	SC 2-core (flat) connector (multimode fiber, 850 nm wavelength)
NE1G-1L, NE1G-1LA, NE1G-1LB	SC 2-core (flat) connector (multimode/single-mode fiber, 1300 nm wavelength)
NE1G-1LHA, NE1G-1LHA8, NE1G-1LHBA	SC 2-core (flat) connector (multimode/single-mode fiber, 1500 nm wavelength)

3.5.4 NWVX-4

The NWVX-4 physically appears as Figure 3-25. This NIF has four ports for V.24/X.21/V.35 connections via half-pitched 50-pin connectors on the router side, which require specific connector pin assignments for respective interfaces. See Table 3-23, Table 3-24, and Table 3-25 for the connector specifications.

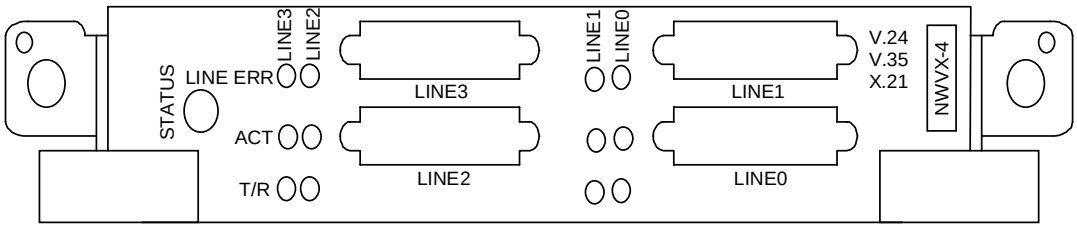


Figure 3-25 NWVX-4 Front Panel View

Switch and LED indication

Table 3-21 NWVX-4 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program being loaded.) Red: Fault Extinguished: Operation not possible (Including the device power supply being turned off)
T/R	LED: Green	Shows the operating condition of each line.	LED: Green Green: State of transmission and reception signals in line.
ACT	LED: Green		Line operation (open) state.
LINE ERR	LED: Yellow		Yellow: Line fault detection.

Table 3-22 NWVX-4 LINE LED indication

Act (*1)	LINE ERR (*1)	T/R (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	--	(*3)	Being initialized.		Being initialized (3).	initialize
G	--	(*3)	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)	Line test.		Line being tested (9).	test
--	--	--	In fault.		In fault (4).	fault
--	--	--	Command being blocked.		In maintenance (7).	closed
--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--	Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*
*(*2): Meaning and value of SMNP private MIB and gr2kPhysLineOperStatus*
*(*3): The T/R LED lights and goes off by H/W. In lighting conditions, this LED lights in green when the logical value of send and receive data is "0". The LED lights in green when lighting conditions are detected irrespective of the line state.*

Table 3-23 Connector Specifications for NWVX-4, Pin Assignment for V.24

WAN 25-pin (Male)	Connection	Router 50-pin	Specifications
2	————	9	SD (send data) (output)
3	————	10	RD (receive data) (input)
4	————	15	RS (request to send) (output)
5	————	16	CS (clear to send) (input)
6	————	12	DR (date set ready) (input)
7	————	34	SG (signal ground)
8	————	30	CD (carrier detect of data channel receive) (input)
15	————	22	ST2 (send element timing 2) (input)
17	————	32	RT (receive element timing) (input)
18	————	13	LLB (output)
20	————	11	ER (data terminal ready) (output)
21	————	23	RLB (output)
22	————	24	Ci (call indicator) (input)
24	————	31	ST1 (send element timing 1) (output)
25	————	14	Ti (test indicator) (input)
1	————	shell	FG (frame ground)
		43 -44	Connection is required if the router is DTE. Separate contact is required if it is DCE.
		45 -46	
		5 - 6	

Table 3-24 Connector Specifications for NWVX-4, Pin Assignment for X.21

WAN 15-pin (Male)	Connection	Router 50-Pin	Specifications
5	————	2	I(A) (indication) (input)
12	————	4	I(B)
4	————	26	R(A) (receive) (input)
11	————	28	R(B)
8	————	34	G (signal ground)
6	————	50	S(A) (signal element timing) (input)
13	————	48	S(B)
3	————	1	C(A) (control) (output)
10	————	3	C(B)
2	————	25	T(A) (transmit) (output)
9	————	27	T(B)
		-46	Connection is required if the router is DTE. Separate contact is required if it is DCE.
		-6	

Table 3-25 Connector Specifications for NWVX-4, Pin Assignment for V.35

WAN 35-pin (Male)	Connection	Router 50-Pin	Specifications
B	————	34	SG (signal ground)
E	————	12	DR (data set ready) (input)
J	————	24	Ci (call indicator) (input)
F	————	30	CD (carrier detect of data channel receive) (input)
D	————	16	CS (clear to send) (input)
H	————	11	ER (data terminal ready) (output)
Y	————	38	ST2(A) (send element timing 2) (input)
AA	————	36	ST2(B)
U	————	41	ST1(A) (send element timing 1) (output)
W	————	39	ST1(B)
P	————	19	SD(A) (send data) (output)
S	————	17	SD(B)
R	————	20	RD(A) (receive data) (input)
T	————	18	RD(B)
LL	No connection	13	LLB (output)
V	————	42	RT(A) (receive element timing) (input)
X	————	40	RT(B)
C	————	15	RS (request to send) (output)
NN	No connection	14	Ti (test indicator) (input)
A	————		Shield (frame ground)

3.5.5 NWVX-8

The NWVX-8 physically appears as Figure 3-26.

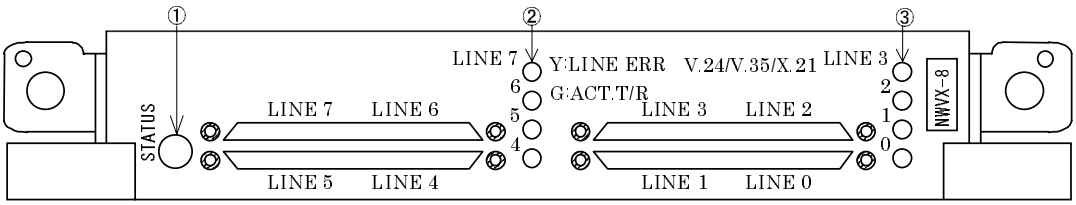


Figure 3-26 NWVX-8 Front Panel View

Switch and LED indication

Table 3-26 NWVX-8 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/Red	Shows the operating condition of NIF	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program beingloaded.) Red: Fault Extinguished: Operation not possible (Including thedevice power supply being turned off)
ACT, T/R	LED: Green	Shows the operating condition of each line.	Line operation (open) state. Green: State of transmission and reception signals in line.
LINE ERR	LED: Yellow		Yellow: Line fault detection.

Table 3-27 NEW1-8 switch and function of LED indication

ACT LINE ERR (*1)	T/R LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	(*3)	Being initialized.		Being initialized (3).	initialize
G	(*3)	Being operated	In normal operation.	In standby (3).	active up
Y	(*3)		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	(*3)	Line test.		Line being tested (9).	test
--	--	In fault.		In fault (4).	fault
--	--	Command being blocked.		In maintenance (10).	closed
--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*
*(*2): Meaning and value of SMNP private MIB and gr2kPhysLineOperStatus*
*(*3): The T/R LED lights and goes off by H/W. In lighting conditions, this LED lights in green when the logical value of send and receive data is "0". The LED lights in green when lighting conditions are detected irrespective of the line state.*

Note: When making connection with the cable having come off, repeat cancellation of the LED and lighting up of the ERR (or ACT) LED to retry the CLOSE/OPEN operation of the line.

Precautions when connecting NWVX-8

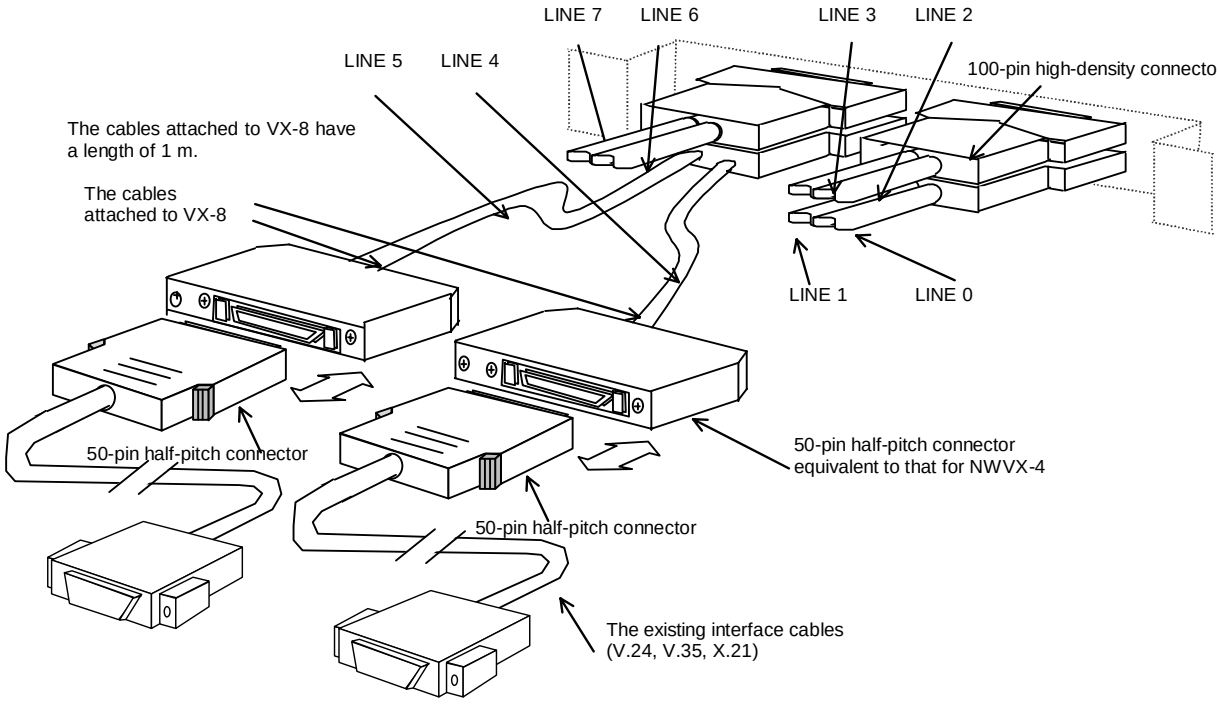
- Relationship between connection of cables supplied with VX-8 and LINE number

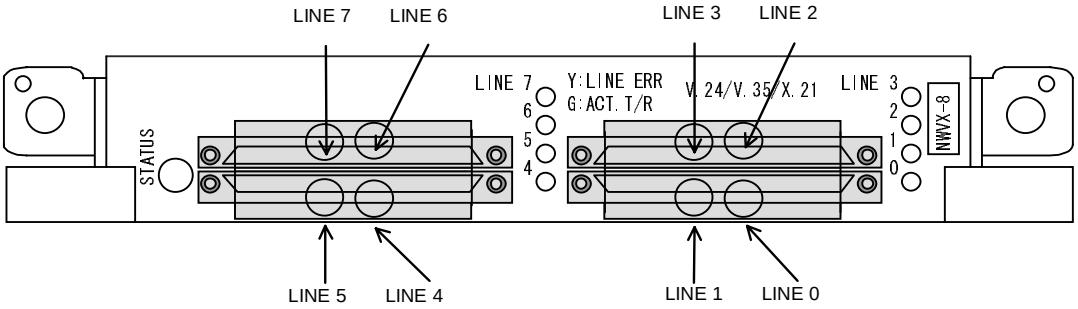
  NWVX-8 is supplied with the cables attached to VX-8.

  Connect the cables attached to VX-8 (100-pin high-density connector) as shown below.

  The tips of the cables attached to VX-8 have connecting sections for the same 50-pin half-pitch connectors (LINE 0 to LINE 7) as in NWVX-4.

Be careful when connecting the cables attached to VX-8 to the devices that the connector insertion faces are reversed between the lower side connectors (LINE 0, LINE 1, and LINE 4, LINE 5) and the upper side connectors (LINE 2, LINE 3, and LINE 6, LINE 7).





When connecting the cables attached to VX-8 to the devices, tighten the connectors lightly to the standard torque of 1.5 kgf/cm by using a screw driver (a small sized screw driver is recommended). **Be extremely careful not to over-tighten** (which may cause the bolts to break).

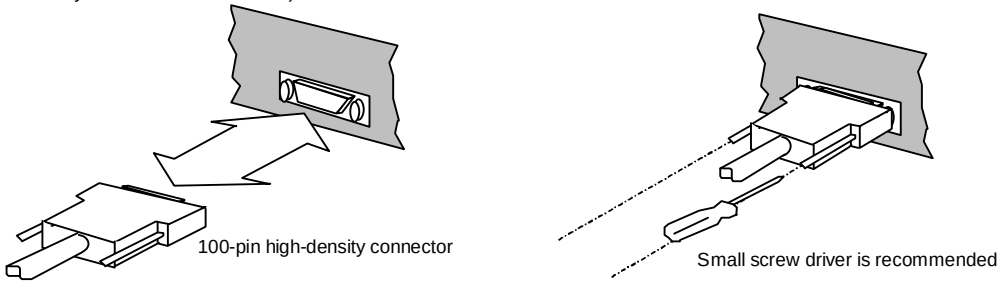


Figure 3-27 Relationship between connection of cables supplied with VX-8 and LINE number

- Line numbers for the cables attached to VX-8

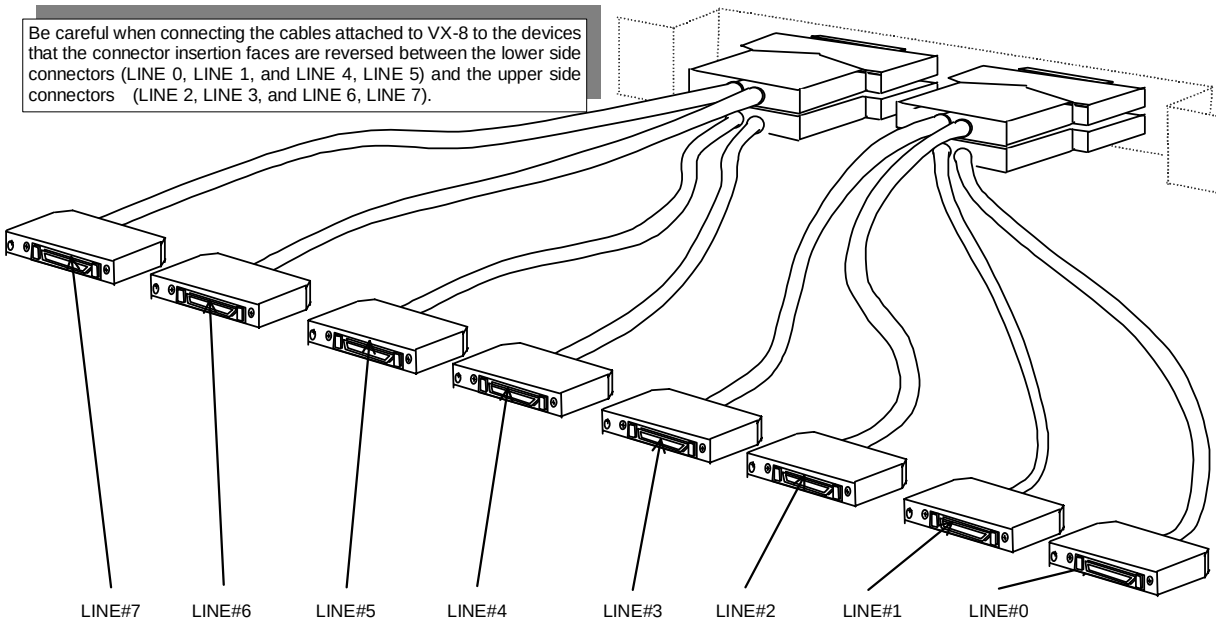

Be careful when connecting the cables attached to VX-8 to the devices that the connector insertion faces are reversed between the lower side connectors (LINE 0, LINE 1, and LINE 4, LINE 5) and the upper side connectors (LINE 2, LINE 3, and LINE 6, LINE 7).
LINE#7
LINE#6
LINE#5
LINE#4
LINE#3
LINE#2
LINE#1
LINE#0

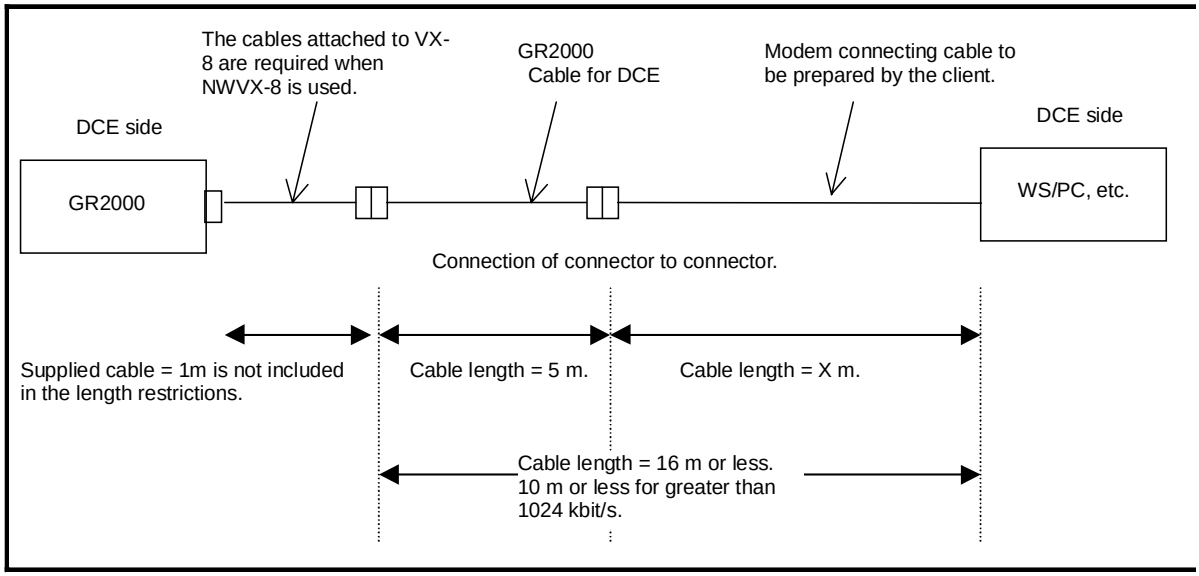
Figure 3-28 Line numbers for the cables attached to NWVX-8

- Precautions when using the cables attached to VX-8

1. The tips of the cables attached to VX-8 can be connected with loop connectors (the same as those for NWVX-4). This connection makes the loop connector test possible.
2. The tips of the cables attached to VX-8 should be protected from dust when not connected by covering them with vinyl bags.

Figure 3-29 Precautions when using the cables attached to VX-8

of cable length according to line speed" described in Section 5: Precautions.


The cables attached to VX-8 are required when NWVX-8 is used.
GR2000 Cable for DCE
Modem connecting cable to be prepared by the client.
DCE side
DCE side
GR2000
WS/PC, etc.
Connection of connector to connector.
Supplied cable = 1m is not included in the length restrictions.
Cable length = 5 m.
Cable length = X m.
Cable length = 16 m or less.
10 m or less for greater than 1024 kbit/s.

LINE 0 to 7 (50-pin half-pitch connectors) on the tips of the conversion cables are the connectors to connect V.24/X.21/V.35, which require dedicated cables to match each interface. Specification of the pins including the cable is shown below (the same as that for NWVX-4U).

Table 3-28 Connector Specifications for NWVX-8, Pin Assignment for V.24

WAN 25-pin (Male)	Connection	Router 50-pin	Specifications
2	————	9	SD (send data) (output)
3	————	10	RD (receive data) (input)
4	————	15	RS (request to send) (output)
5	————	16	CS (clear to send) (input)
6	————	12	DR (date set ready) (input)
7	————	34	SG (signal ground)
8	————	30	CD (carrier detect of data channel receive) (input)
15	————	22	ST2 (send element timing 2) (input)
17	————	32	RT (receive element timing) (input)
18	————	13	LLB (output)
20	————	11	ER (data terminal ready) (output)

WAN 15-pin (Male)	Connection	Router 50-Pin	Specifications
5	————————	2	I(A) ┐ (indication) (input)
12	————————	4	I(B) ┘
4	————————	26	R(A) ┐ (receive) (input)
11	————————	28	R(B) ┘
8	————————	34	G (signal ground)
6	————————	50	S(A) ┐ (signal element timing) (input)
13	————————	48	S(B) ┘
3	————————	1	C(A) ┐ (control) (output)
10	————————	3	C(B) ┘
2	————————	25	T(A) ┐ (transmit) (output)
9	————————	27	T(B) ┘
(Note) When the router side is X21DTE, connect the 45-46/5-6 pins for the 50-pin half-pitch connecto on the router side.			

Table 3-30 Connector Specifications for NWVX-8, Pin Assignment for V.35

WAN 35-pin (Male)	Connection	Router 50-Pin	Specifications

The NWJB-8 physically appears as Figure 3-32. This NIF has eight ports for connection with 8-pin modular connectors of RJ-45 in compliance with IS8877. Table 3-32 shows the connector specifications.

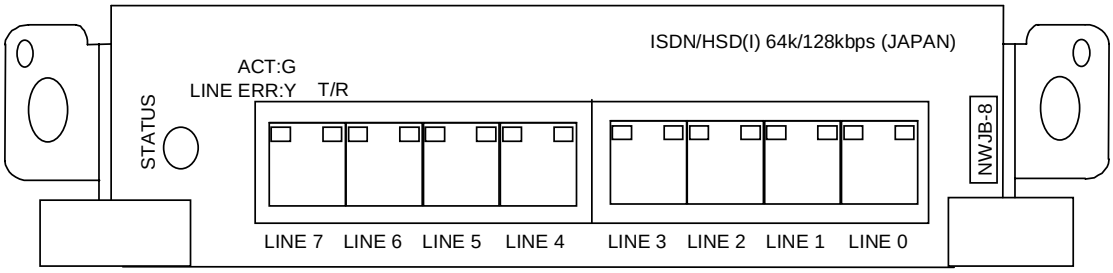


Figure 3-32 NWJB-8 Front Panel View

Switch and LED indication

Table 3-31 NWJB-8 switch and function of LED indications

Name	LED: Color	Status	Content

The NWJ1-4U physically appears as Figure 3-33. This NIF has four ports for connection with 8-pin modular connectors of RJ-45 in compliance with IS8877. Table 3-34 shows the connector specifications.

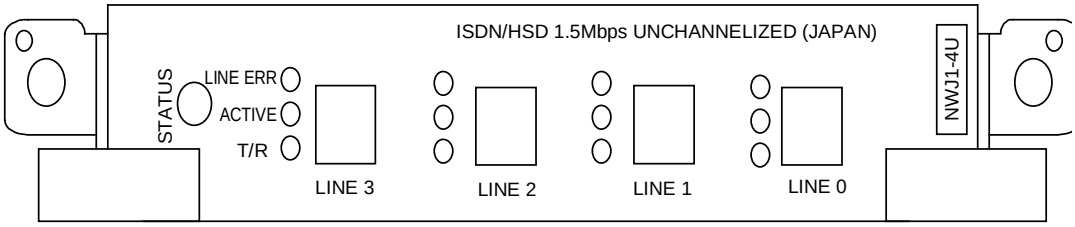


Figure 3-33 NWJ1-4U Front Panel View

Switch and LED indication

Table 3-33 NWJ1-4U switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

The NWMX1-4 physically appears as Figure 3-34. This NIF has four ports for connection with 8-pin modular connectors of RJ-45 in compliance with IS8877. Table 3-36 shows the connector specifications.

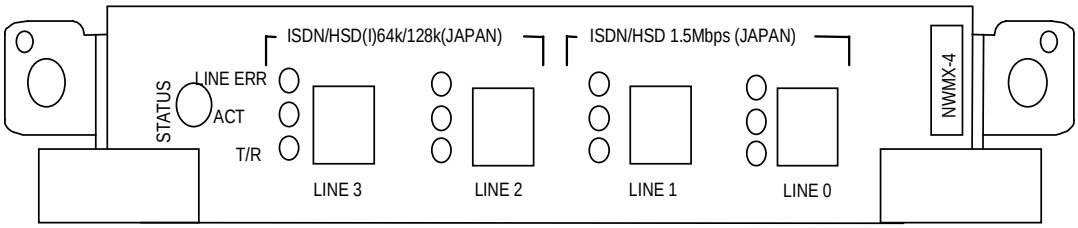


Figure 3-34 NWMX1-4 Front Panel View

Switch and LED indication

Table 3-35 WMX-1-4 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

The NWJ1-8U physically appear as Figure 3-35.

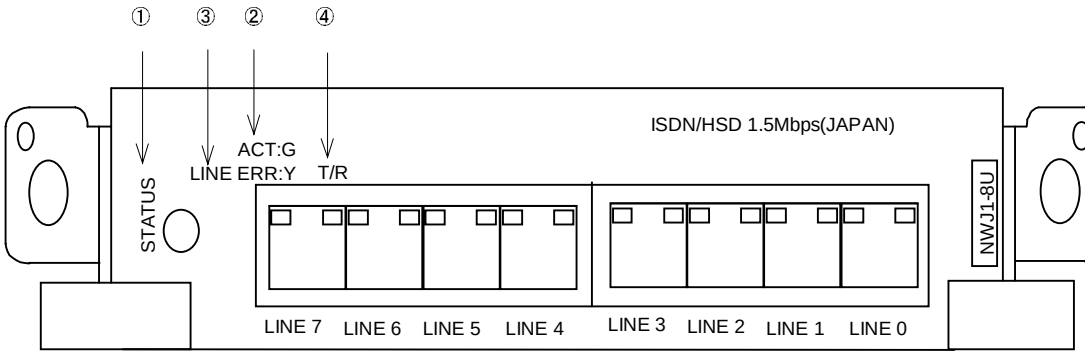


Figure 3-35 NWJ1-8U Front Panel View

Switch and LED indication

Table 3-37 NWJ1-8U switch and function of LED indications

The NWT1-4 physically appears as Figure 3-36. This NIF has four ports for connection with 8-pin modular connectors of RJ-48. Table 3-38 shows the connector specifications.

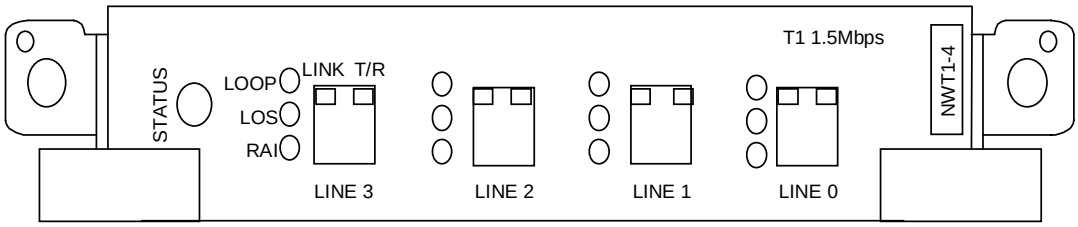


Figure 3-36 NWT1-4 Front Panel View

Switch and LED indication

Table 3-39 NWT1-4 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program being

LINE (*1)	T/R (*1)	RAI (*1)	LOS (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	(*3)	--	--	--	Being operated	In normal operation.	In standby (3).	active up
Y	(*3)	Y	Y	--		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	(*3)	--	--	--	Line test.		Line being tested (9).	test
G	(*3)	--		Y	In loop upon request from counterpart.		In loop upon request from counterpart (12).	Looped by remote
--	--				In fault.		In fault (4).	fault
--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--				Configuration		Configuration	mismatch

The NWE1-4 physically appears as Figure 3-37. This NIF has four ports for connection with 8-pin modular connectors of RJ-48. Table 3-44 shows the connector specifications.

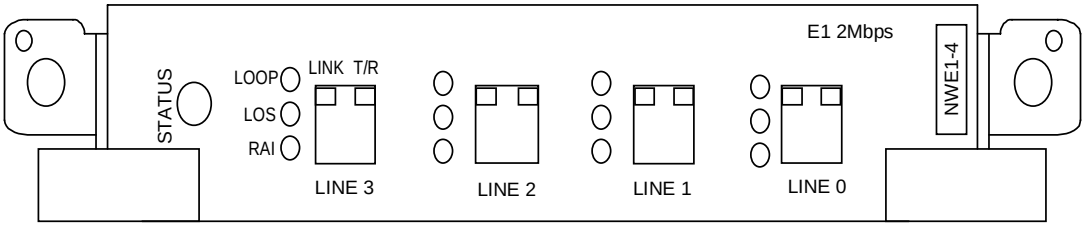


Figure 3-37 NWE1-4 Front Panel View

Switch and LED indication

Table 3-42 NWE1-4 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

LINE (*1)	T/R (*1)	LOS (*1)	RAI (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	(*3)	--	--	--	Being operated	In normal operation.	In standby (3).	active up
--	(*3)	Y	Y	--		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	(*3)	--	--	--	Line test.		Line being tested (9).	test
--	--				In fault.		In fault (4).	fault
--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--				Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*

The NWJ2-1U physically appears as Figure 3-38. This NIF has one port for connection with a pair of BNC connectors (receive and transmit). Table 3-47 shows the connector specifications.

Figure 3-38 NWJ2-1U Front Panel View

Switch and LED indication

Table 3-45 NW2J-1U switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

Act (*1)	LINE ERR (*1)	T/R (*1)	AIS (*1)	LOS (*1)	RAI (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in M and browse
--	--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	--	(*3)		Y	--	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)	Y	Y	Y		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)		(*4)		Line test.		Line being tested (9).	test
--	--	--				In fault.		In fault (4).	fault
--	--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*

The NWT3-2U physically appears as Figure 3-39. This NIF has two ports for connection with pairs of BNC connectors (receive and transmit). Table 3-50 shows the connector specifications.

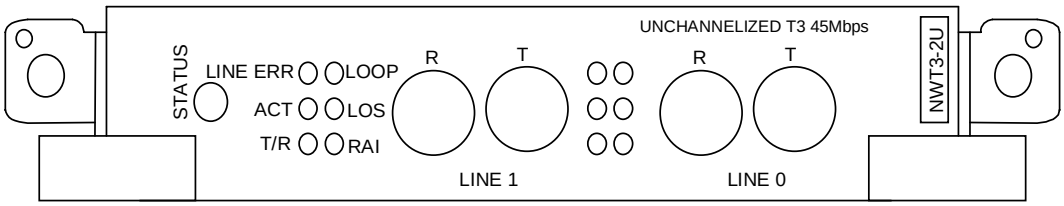


Figure 3-39 NWT3-2U Front Panel View

Switch and LED indication

Table 3-48 NWT3-2U switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

Act (*1)	LINE ERR (*1)	T/R (*1)	LOS (*1)	RAI (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in M and browse
--	--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	--	(*3)			--	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)	Y	Y			Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)				Line test.		Line being tested (9).	test
G	--	(*3)			Y	In loop upon request from counterpart.		In loop upon request from counterpart (12).	looped by rem
--	--	--				In fault.		In fault (4).	fault
--	--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration		Configuration	mismatch

The NWE3-2U physically appears as Figure 3-40. This NIF has two ports for connection with pairs of BNC connectors (receive and transmit). Table 3-53 shows the connector specifications.

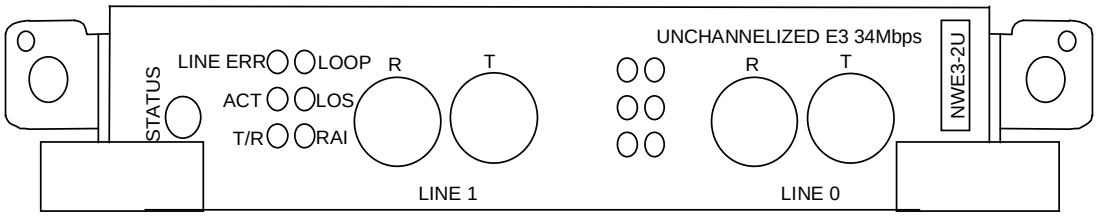


Figure 3-40 NWE3-2U Front Panel View

Switch and LED indication

Table 3-51 NWE3-2U switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

Act (*1)	LINE ERR (*1)	T/R (*1)	LOS (*1)	RAI (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in M and browse
--	--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	--	(*3)	Y	Y	--	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)	Y	Y			Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)				Line test.		Line being tested (9).	test
G	--	(*3)			Y	In loop upon request from counterpart.		In loop upon request from counterpart (12).	looped by rem
--	--	--				In fault.		In fault (4).	fault
--	--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration		Configuration	mismatch

The NWE3-1C physically appear as Figure 3-41.

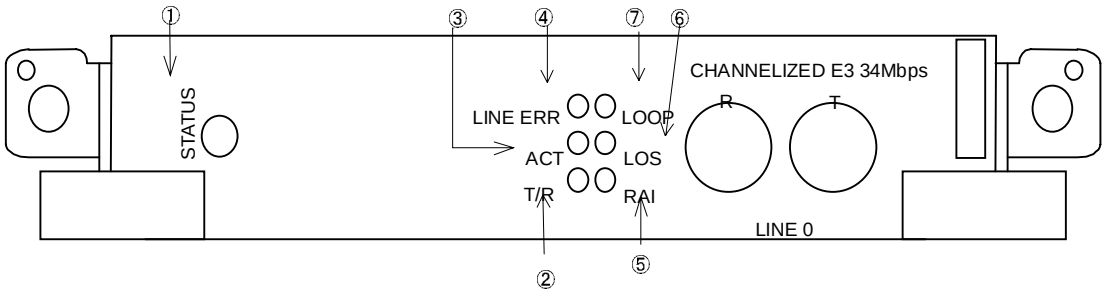


Figure 3-41 NWE3-1C Front Panel View

Switch and LED indication

Table 3-54 NWE3-1C switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/	Shows the operating	Green: Operable operation

Act (*1)	LINE ERR (*1)	T/R (*1)	RAI (*1)	LOS (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in M and browse
--	--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	--	(*3)	Y	Y	--	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)					Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)				Line test.		Line being tested (9).	test
--	--	--				In fault.		In fault (4).	fault
--	--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*

The NWOC3C-2M, NWOC3C-2S, NWOC3C-2SD and NWOC3C-2MD physically appear as Figure 3-42. These NIFs each have two ports for connection with pairs of SC 2-core optical fiber connectors (transmit and receive). Table 3-59 shows the connector specifications.

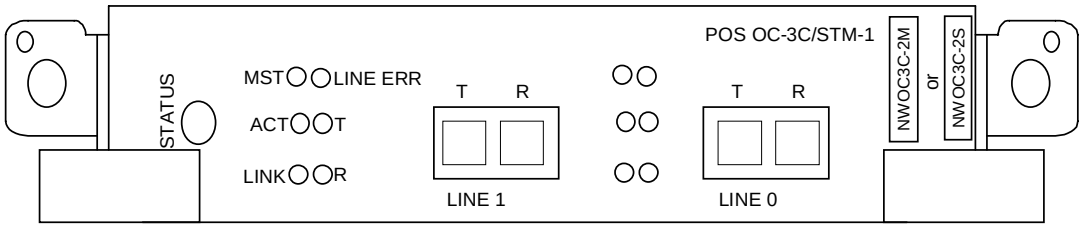


Figure 3-42 NWOC3C-2M, NWOC3C-2S, NWOC3C-2SD and NWOC3C-2MD Front Panel View

Switch and LED indication

Table 3-57 NWOC3C-2S/NWOC3C-2M/NWOC3C-2SD/NWOC3C-2MD switch and function of LED indications

function of LED indication

Act (*1)	LINE ERR (*1)	T (*1)	R (*1)	LINK (*1)	MST (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in M and browse
--	--	(*3)	(*3)	--	G	Being initialized.		Being initialized (3).	initialize
G	--	(*3)	(*3)	(*4)	G	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)	(*3)		G		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)	(*3)		G	Line test.		Line being tested (9).	test
--	--	--			--	In fault.		In fault (4).	fault
--	--	--			G	Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	G	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

The NWOC3C-8S and NWOC3C-8M physically appear as Figure 3-43.

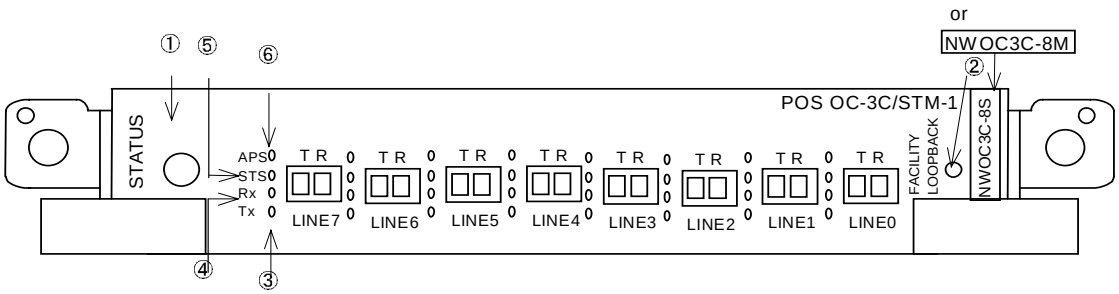


Figure 3-43 NWOC3C-8S and NWOC3C-8M Front Panel View

Switch and LED indication

Table 3-60 NWOC3C-8S/NWOC3C-8M switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/	Shows the operating	Green: Operable operation

The NWOC12C-1S and NWOC12-1SD physically appears as Figure 3-44. This NIF has one port for connection with a pair of SC 2-core optical fiber connectors (recei and transmit). Table 3-63 shows the connector specifications.

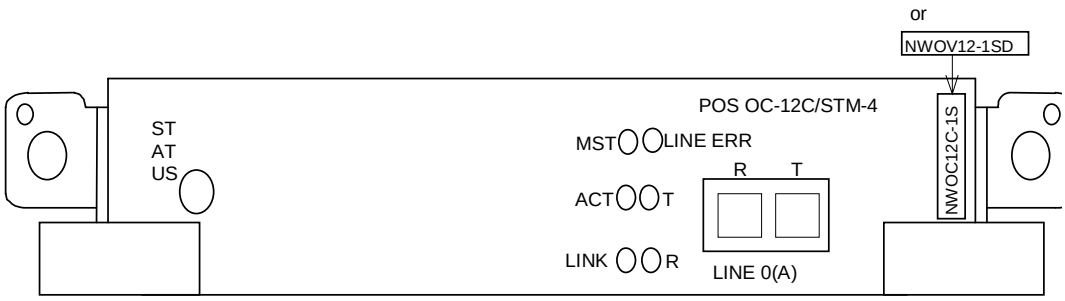


Figure 3-44 NWOC12C-1S and NWOC12-1SD Front Panel View

Switch and LED indication

Table 3-62 NWOC12C-1S/NWOC12-1SD switch and function of LED indications

Name	LED: Color	Status	Content

The NWOC12-4S and NWOC12-4M physically appear as Figure 3-45.

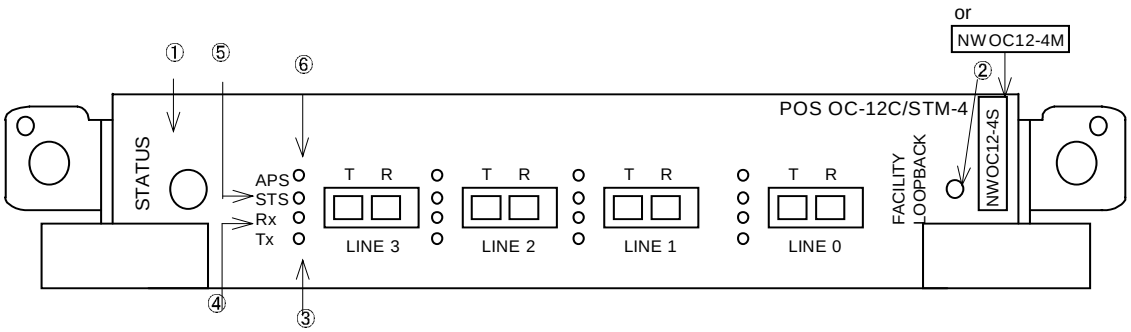


Figure 3-45 NWOC12-4S and NWOC12-4M Front Panel View

Switch and LED indication

Table 3-64 NWOC12-4S/NWOC12-4M switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state.

The NWOC48-1S, NWOC48-1S4, and NWOC48-1S8 physically appear as Figure 3-46. These NIFs each have one port for connection with a pair of SC 2-core optica fiber connectors (transmit and receive). Table 3-67 shows the connector specifications.

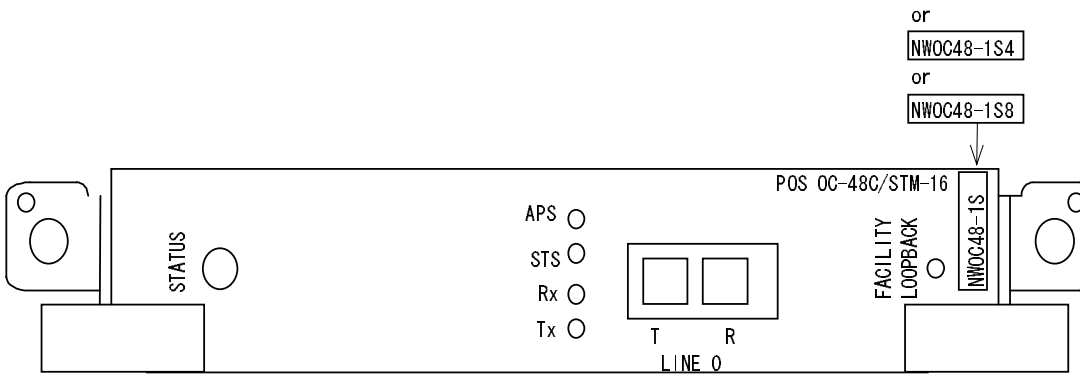


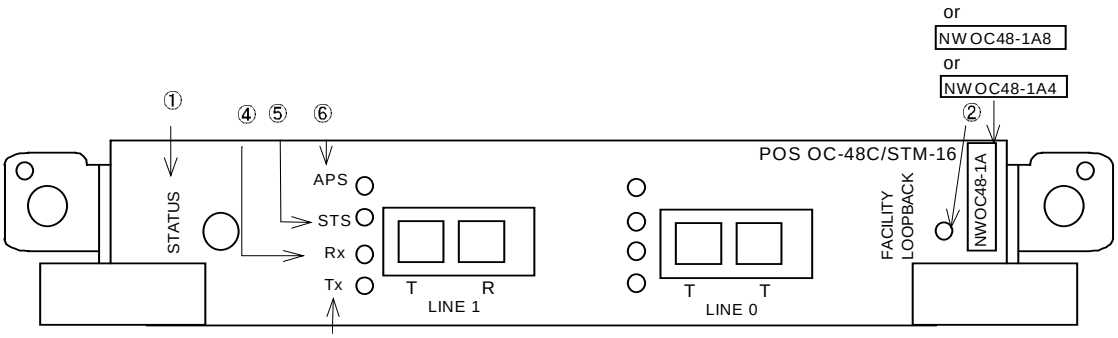
Figure 3-46 NWOC48-1S, NWOC48-1S4 and NWOC48-1S8 Front Panel View

Switch and LED indication

NIF	Connector Specifications
NWOC48-1S	SC 2-core (flat) connector (single-mode fiber)
NWOC48-1S4	SC 2-core (flat) connector (single-mode fiber)
NWOC48-1S8	SC 2-core (flat) connector (single-mode fiber)

3.5.21 NWOC48-1A, NWOC48-1A4 and NWOC48-1A8

The NWOC48-1A, NWOC48-1A4 and NWOC48-1A8 physically appear as Figure 3-47.



indication

Status		Green	Yellow	Extinguished
No APS				O
APS steady state	Working being selected	O		
	Protection being selected			O
APS switching over	Working being selected			O
	Protection being selected		O	
Lamp tested		O		

Table 3-70 Connector Specifications for NWOC48-1A, NWOC48-1A4 and NWOC48-1A

NIF	Connector Specifications
NWOC48-1A	SC 2-core (flat) connector (singlemode fiber)
NWOC48-1A4	SC 2-core (flat) connector (singlemode fiber)
NWOC48-1A8	SC 2-core (flat) connector (singlemode fiber)

The NAOC3-1M and NAOC3-1S physically appear as Figure 3-48. These NIFs each have one port for connection with a pair of SC 2-core optical fiber connectors (transmit and receive). Table 3-72 shows the connector specifications.

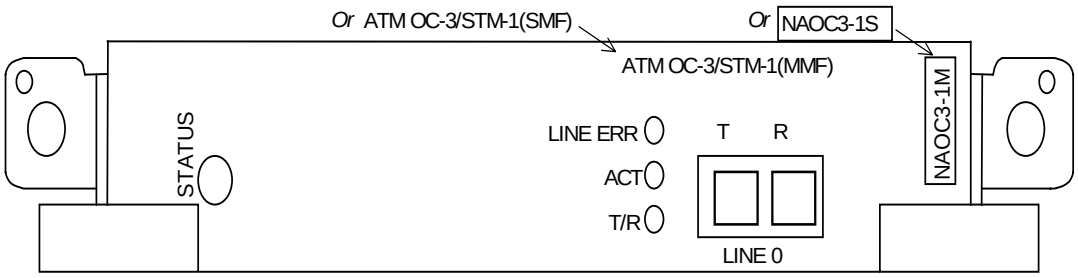


Figure 3-48 NAOC3-1M and NAOC3-1S Front Panel View

Switch and LED indication

Table 3-71 NWOC3-1S/NWOC3-1M switch and function of LED indications

Name	LED: Color	Status	Content

The NA25M-1 physically appears as Figure 3-49. This NIF has one port for connection with an 8-pin modular connector of RJ-45. Table 3-74 shows the connector specifications.

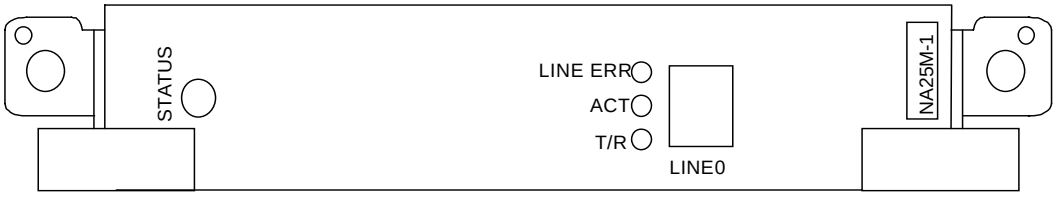


Figure 3-49 NA25M-1 Front Panel View

Switch and LED indication

Table 3-73 NWOC3-1S/NWOC3-1M switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program being loaded.)

The NAOC3-8S and NAOC3-8M physically appear as Figure 3-42

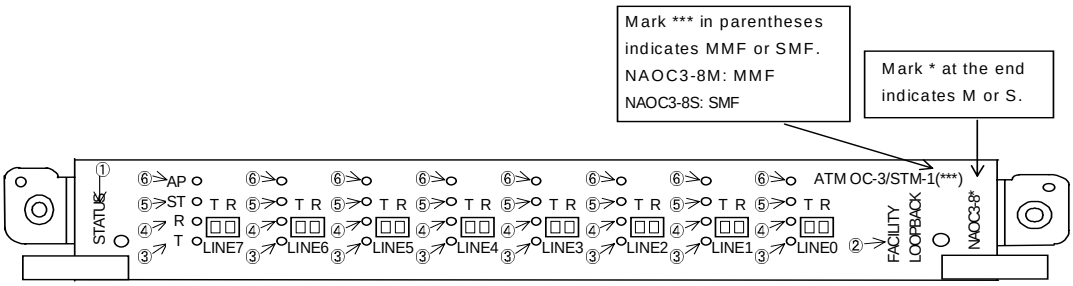


Figure 3-50 NAOC3-8S and NAOC3-8M Front Panel View

Switch and LED indication

Table 3-75 NWOC3-8M/-8S switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/	Shows the operating	Green: Operable operation

The NAOC12-2S and NAOC12-2M physically appear as Figure 3-51.

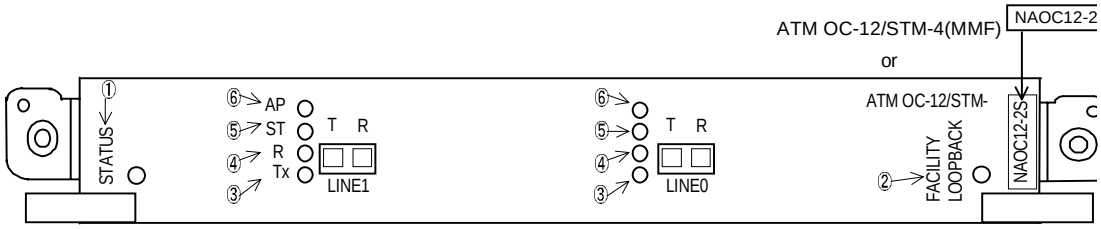


Figure 3-51 NAOC12-2S and NAOC12-2M Front Panel View

Switch and LED indication

Table 3-77 NWOC12-2S/NWOC12-2M switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state/ lamp tested.

The NE1G-4C physically appears as Figure 3-52.

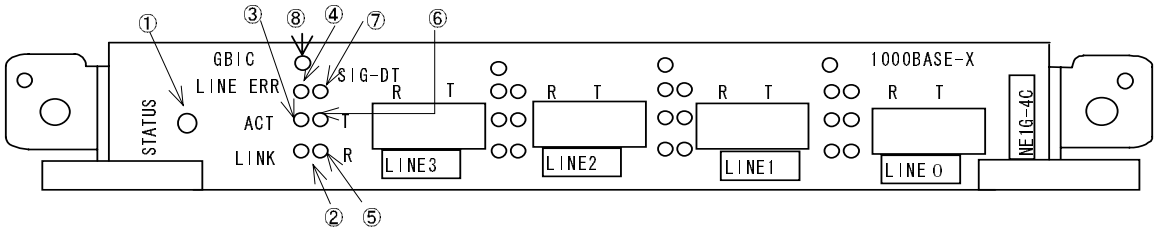


Figure 3-52 NE1G-4C Front Panel View

Switch and LED indication

Table 3-79 NE1G-4C switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state/ lamp tested. Green blinking: Under preparation. (Program being

The NWT3-1C physically appears as Figure 3-53.

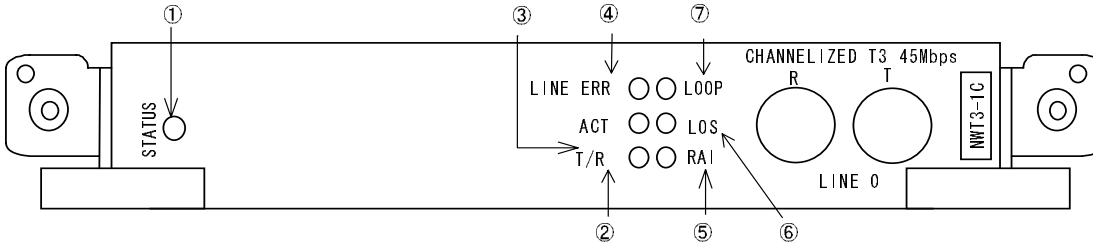


Figure 3-53 NWT3-1C Front Panel View

Switch and LED indication

Table 3-81 NWT3-1C switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Yellow: Blocking and the board replaceable state. Green blinking: Under preparation (Program being loaded.)

Act (*1)	LINE ERR (*1)	T/R (*1)	RAI (*1)	LOS (*1)	LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	--	(*3)	--	--	--	Being initialized.		Being initialized (3).	initialize
G	--	(*3)	Y	Y	--	Being operated	In normal operation.	In standby (3).	active up
--	Y	(*3)					Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	--	(*3)				Line test.		Line being tested (9).	test
--	--	--				In fault.		In fault (4).	fault
--	--	--				Command being blocked.		In maintenance (10).	closed
--	--	--	--	--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	--				Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*

The NWE1-8 physically appears as Figure 3-54.

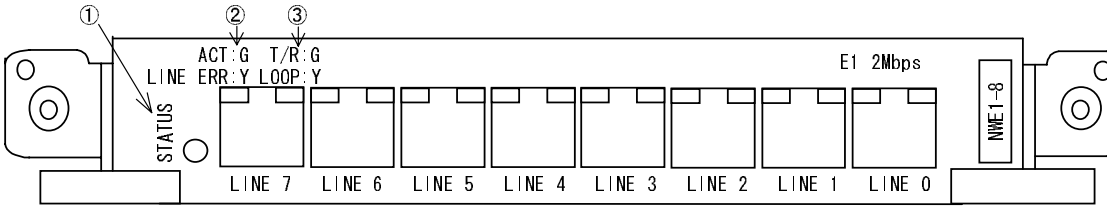


Figure 3-54 NWE1-8 Front Panel View

Switch and LED indication

Table 3-84 NEW1-8 switch and function of LED indications

Name	LED: Color	Status	Content
STATUS	LED: Green/ Yellow/ Red	Shows the operating condition of NIF.	Green: Operable operation Green blinking: Under preparation (Program being loaded.) Yellow: Blocking and the board replaceable state.

ACT LINE ERR (*1)	T/R LOOP (*1)	Line state	Detail of state	State as seen by SXMP	Line state indication in MMI and browser
--	(*3)	Being initialized.		Being initialized (3).	initialize
G	(*3)	Being operated	In normal operation.	In standby (3).	active up
--	(*3)		Line fault being occurred.	In operation (line fault being occurred (8).	active down
G	(*3)	Line test.		Line being tested (9).	test
--	--	In fault.		In fault (4).	fault
--	--	Command being blocked.		In maintenance (10).	closed
--	--	Not used.	Configuration definition not set yet	Not used. Configuration definition not set yet. (10)	unused
--	--	Configuration definitions not agreed.		Configuration definitions not agreed. (11)	mismatch

*(*1): G: Lights in green, Y: Lights in yellow, -: Goes off*

*(*2): Meaning and value of SMNP private MIB and gr2kPhysLineOperStatus*

*(*3): The T/R LED lights and goes off by H/W. In lighting conditions, this LED lights in green when the logical value of*

Various types of POW models apply to the GR2000 device models as listed in Table 3-87. Additional information on each POW model follows.

Table 3-87 POW Models

Model Name	Components	Application		
		Device Model	Power Supply Configuration	Q’
POW-S100S	• One power unit • One power cord	GR2000-4S	Single 100 or 200 VAC input	1
			Dual 100 or 200 VAC input	2
POW-H100H	• One power unit • One power cord	GR2000-6H	Single 100 or 200 VAC input	1
			Dual 100 or 200 VAC input	2
POW-HDCH	• One power unit	GR2000-6H	Single -48 or -60 VDC input	1
			Dual -48 or -60 VDC input	2
POW-M100H	• One AC input unit • One power cord • Three DC-DC power units	GR2000-10H	Single 100 VAC input	1
			Dual 100 VAC input	1
POW-M100HA	• One AC input unit • One power cord	GR2000-10H	Single 100 VAC input	0
			Dual 100 VAC input	1

		Device Model	Power Supply Configuration	Q'ty
POW-S100	• One power unit • One power cord	GR2000-4	Single 100 or 200 VAC input	1
			Dual 100 or 200 VAC input	2
POW-M100	• One power unit • One power cord	GR2000-10	Single 100 or 200 VAC input	1
			Dual 100 or 200 VAC input	2
POW-MDC	• One DC power unit	GR2000-10	Single -48 or -60 VDC input	1
			Dual -48 or -60 VDC input	2
INPUT-MDC	• One DC input unit	GR2000-10	Single -48 or -60 VDC input	1
			Dual -48 or -60 VDC input	2
POW-L200	• Two power units • One power cord	GR2000-20	Single 200 VAC input	1
			Dual 200 VAC input	2
POW-LDC	• Two DC power units	GR2000-20	Single -48 or -60 VDC input	1
			Dual -48 or -60 VDC input	2
INPUT-LDC	• One DC input unit	GR2000-20	Single -48 or -60 VDC input	1
			Dual -48 or -60 VDC input	2

Figure 3-56 illustrates the power unit of the POW-H100H. The dimensions are approximate (in mm), and the drawing is not to scale.

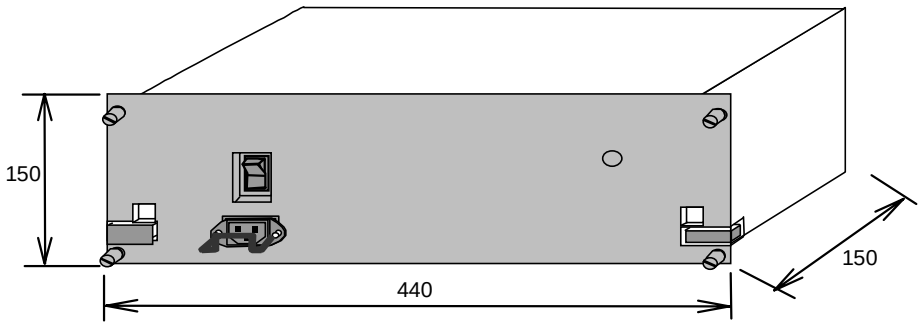


Figure 3-56 Power Unit of POW-H100H

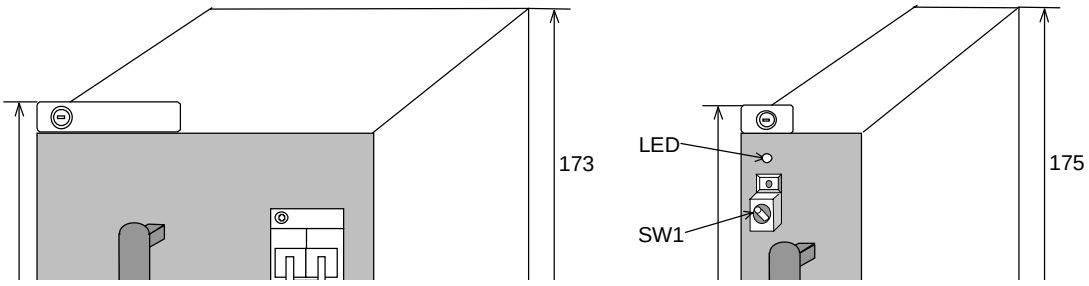
3.6.3 POW-HDCH

Figure 3-57 illustrates the power unit of the POW-HDCH. The dimensions are approximate (in mm), and the drawing is not to scale.

The POW-M100H comprises one AC input unit (SWR4820-U), one power cord, and three DC-DC power units (two DC38001-Us for 3.3V/24V dc output and one DC46003-U for 3.3V/5V dc output). The POW-M100HA comprises one AC input unit (SWR4820-U), one power cord, and one DC-DC power unit (DC46003-U).

Figure 3-58 illustrates the AC input unit and (one of) the DC-DC power unit(s) of the POW-M100H and the POW-M100HA. The dimensions are approximate (in mm), and the drawing is not to scale.

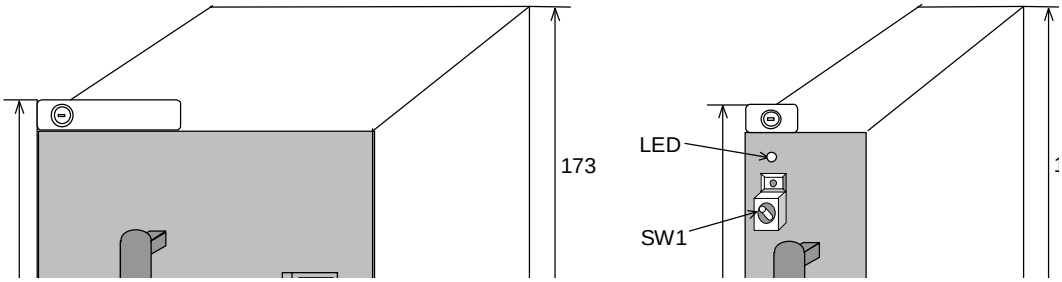
Be noted that the locations for these components are fixed. See Table 3-88, and see also Figure 2-7 and Figure 2-8 in Subsection 2.2.



The POW-M200H comprises one AC input unit (SWR4825-U), one power cord, and three DC-DC power units (two DC38001-Us for 3.3V/24V dc output and one DC46003-U for 3.3V/5V dc output). The POW-M200HA comprises one AC input un (SWR4825-U), one power cord, and one DC-DC power unit (DC46003-U).

Figure 3-59 illustrates the AC input unit and (one of) the DC-DC power unit(s) of th POW-M200H and the POW-M200HA. The dimensions are approximate (in mm), an the drawing is not to scale.

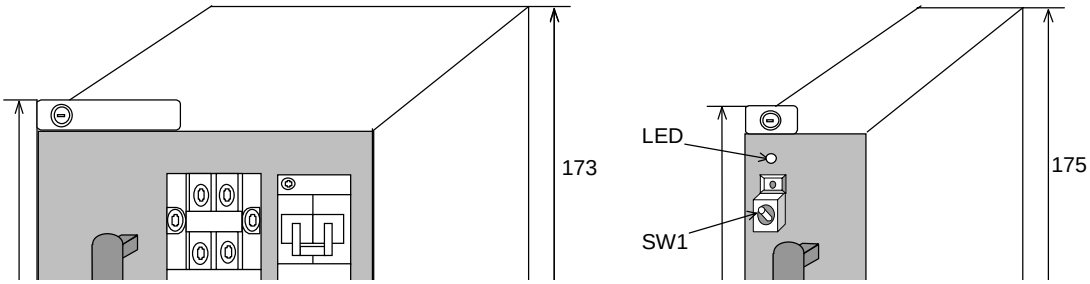
Be noted that the locations for these components are fixed. See Table 3-89, and se also Figure 2-7 and Figure 2-8 in Subsection 2.2.



The POW-MDCH comprises one DC input unit (IN140-6U) and three DC-DC power units (two DC38001-Us for 3.3V/24V dc output and one DC46003-U for 3.3V/5V dc output). The POW-MDCHA comprises one DC input unit (IN140-6U) and one DC-DC power unit (DC46003-U).

Figure 3-60 illustrates the DC input unit and (one of) the DC-DC power unit(s) of the POW-MDCH and the POW-MDCHA. The dimensions are approximate (in mm), and the drawing is not to scale.

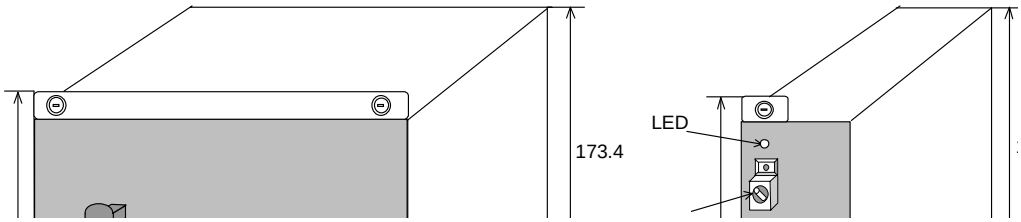
Be noted that the locations for these components are fixed. See Table 3-90, and see also Figure 2-9 and Figure 2-10 in Subsection 2.2.



The POW-L200H comprises one input pannel (IN120-2FU), one AC input unit (SWR4845-U), one input power cord, and five DC-DC power units (two DC03R375-U for 3.3V dc output, two DC38001-Us for 3.3V/24V dc output, and one DC46003-U for 3.3V/5V dc output). The POW-L200HA comprises one input pannel (IN120-2FU one AC input unit (SWR4845-U), one input power cord, and one DC-DC power un (DC46003-U).

Figure 3-61 illustrates the AC input unit and (one of) the DC-DC power unit(s) of th POW-L200H and the POW-L200HA. The dimensions are approximate (in mm), and the drawing is not to scale.

Be noted that the locations for these components are fixed. See Table 3-91, and se also Figure 2-11 and Figure 2-12 in Subsection 2.2.



The POW-LDCH comprises one DC input unit (IN150-6U) and five DC-DC power units (two DC03R375-Us for 3.3V dc output, two DC38001-Us for 3.3V/24V dc output, and one DC46003-U for 3.3V/5V dc output). The POW-LDCHA comprises one DC input unit (IN150-6U) and one DC-DC power unit (DC46003-U).

Figure 3-62 illustrates the DC input unit and (one of) the DC-DC power unit(s) of the POW-LDCH and the POW-LDCHA. The dimensions are approximate (in mm), and the drawing is not to scale.

Be noted that the locations for these components are fixed. See Table 3-92, and see also Figure 2-13 and Figure 2-14 in Subsection 2.2

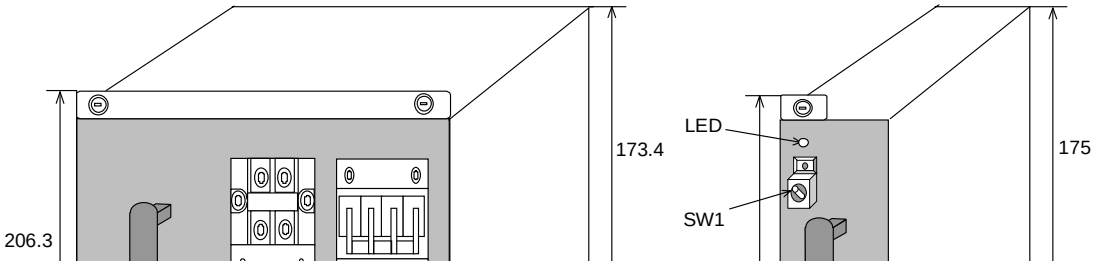


Figure 3-63 illustrates the power unit of the POW-S100. The dimensions are approximate (in mm), and the drawing is not to scale.

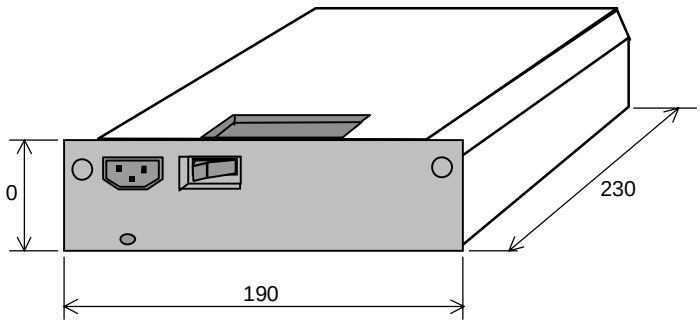


Figure 3-63 Power Unit of POW-S100

3.6.10 POW-M100 and POW-L200

Figure 3-64 illustrates the power unit of the POW-M100 and the POW-L200. The dimensions are approximate (in mm), and the drawing is not to scale.

Figure 3-65 illustrates the DC power unit of the POW-MDC and the POW-LDC. The dimensions are approximate (in mm), and the drawing is not to scale.

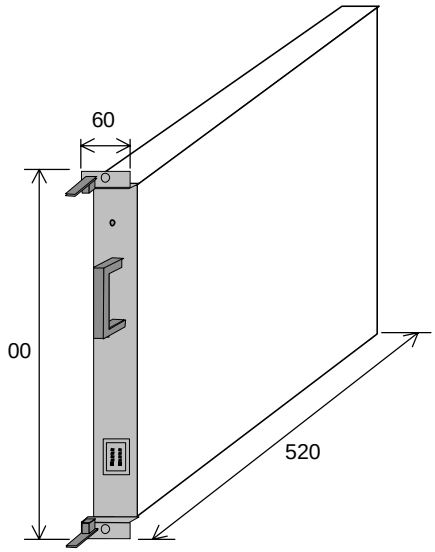


Figure 3-67 commonly illustrates the MC30, a 30-M-byte memory card module, an the MC64, a 64-M-byte memory card module. The dimensions are in mm and the drawing is not to scale.

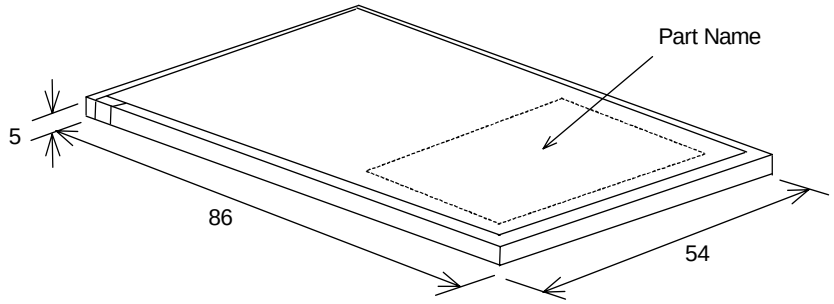


Figure 3-67 MC30 and MC64 Flash Memory Card Module

3.9 Fittings

A loop connector for the WAN line is suppled by each router model. Figure 3-69 shows this WAN Loop Connector.

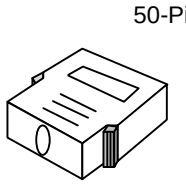


Figure 3-69 WAN Loop Connector

3.9.3 V.24, V.35, and X.21 Interface Cables

These interface cables are supplied as fittings, while the other interface cables are the customer responsibilities. Depending on the type of connection (indirect or direct) and the distance as shown in Figure 3-70 and Table 3-93, a cable with an appropriate part number needs to be specified. Subsection 3.9.3.1 through

The appearance of the V.24 interface cable is as shown in Figure 3-71. Figure 3-72 shows the cable specifications.

When connecting to a TA or modem on the V.24 interface, an HN-F9355-71H cabl (5m), its option for 1m to 16m (request for price quotation basis), or an HN-F9355-71F cable (3m) is applicable. The HN-F9355-71F is required for connection to a 28.8kbps modem.

When using the own router as a DCE and connecting to a DTE-attached cable on th V.24 interface, an HN-F9355-75H cable (5m) is applicable. This direct connection allows the line speed of 19.2 kbps or less, and the maximum cable length of 16 m between the DCE and the DTE.

Line speed range (XR bit/S)	**Cable length limitation**	**Coordinating cable**
9.6 < X ≤ 19.2	16m or shorter.	HN-F9355-71H (5m) Cables other than 5m are coordinated individually.
19.2 < X ≤ 28.8	3m or shorter.	HN-F9355-71F (3m)
(Note 1) It is 2.4 < x ≤ 19.2 in NWVX-8.		

Physical interface	Line speed range (Xkbit/s)	Supported or not.		Restrictions on cable length	Corresponding cable model
		NWVX-4	NWVX-8		
V.24	2.4 ≤ X < 9.6	X	O	16 m or less	HN-F9355-71F, HN-F9355-71H, (Note 1)
	9.6 ≤ X ≤ 19.2	O	O	16 m or less	HN-F9355-71F, HN-F9355-71H, (Note 1)
	19.2 < X ≤ 28.8	O	O	3 m or less	HN-F9355-71F (Note 1)
V.35	48.0 < X ≤ 1024.0	O	O	16 m or less	HN-F9355-72H (Note 1)
	1024.0 ≤ X ≤ 1536.0	O	O	10 m or less	HN-F9355-72H (Note 1)
	1536.0 < X ≤ 2048.0	O	O	5 m or less (Note 2)	HN-F9355-72H (Note 1)
	2048.0 < X ≤ 3072.0	O	X	5 m or less (Note 2)	HN-F935-72H (Note 1)
	3072.0 < X < 6144.0	O	X	1 m or less	(Note 1)
X.21	2.4 ≤ X < 9.6	X	O	16 m or less	HN-F9355-73H (Note 1)
	9.6 ≤ X ≤ 1024.0	O	O	16 m or less	HN-F9355-73H (Note 1)
	1024.0 < X ≤ 1536.0	O	O	10 m or less	HN-F9355-73H (Note 1)
	1536.0 < X ≤ 2048.0	O	O	5 m or less	HN-F9355-73H (Note 1)
	2048.0 < X ≤ 3072.0	O	X	5 m or less (Note 2)	HN-F9355-73H (Note 1)
	3072.0 < X ≤ 6144.0	O	X	1 m or less	(Note 1)

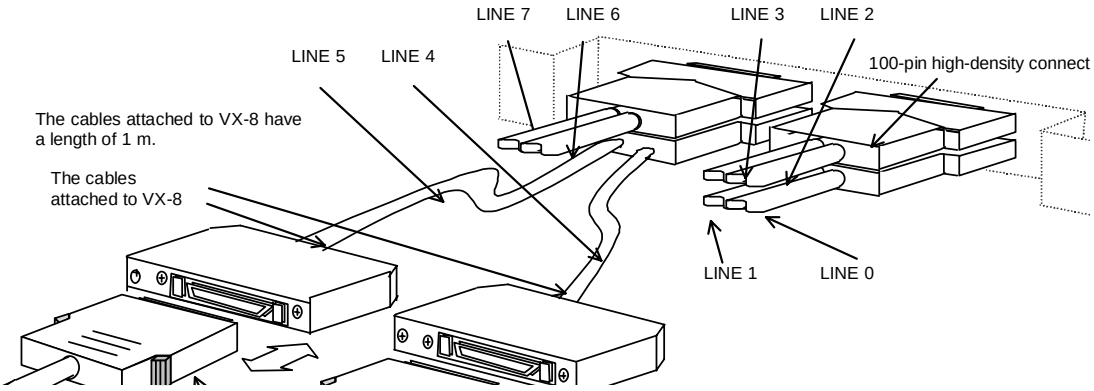
(Note 1) The above corresponding cable model indicates the type of standard cables. Special order cables are also

NWVX-8 is supplied with the cables attached to VX-8.

Connect the cables attached to VX-8 (100-pin high-density connector) as show below.

The tips of the cables attached to VX-8 have connecting sections for the same 50-pin half-pitch connectors (LINE 0 to LINE 7) as in NWVX-4.

Be careful when connecting the cables attached to VX-8 to the devices that the connector insertion faces are reversed between the lower side connectors (LINE 0, LINE 1, and LINE 4, LINE 5) and the upper side connectors (LINE 2, LINE 3, and LINE 6, LINE 7).



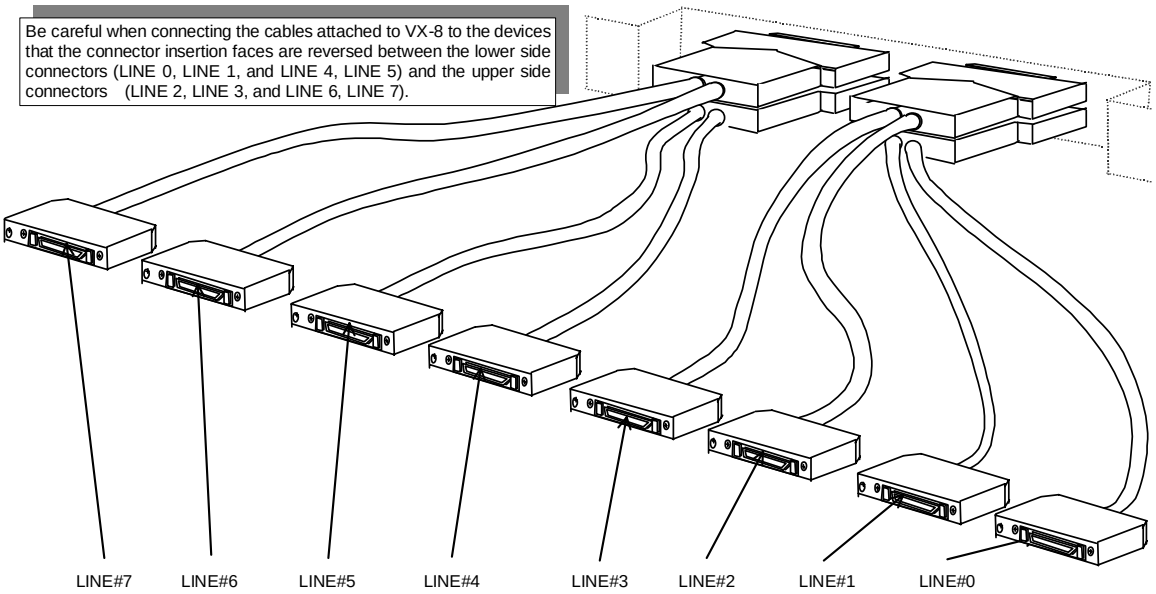
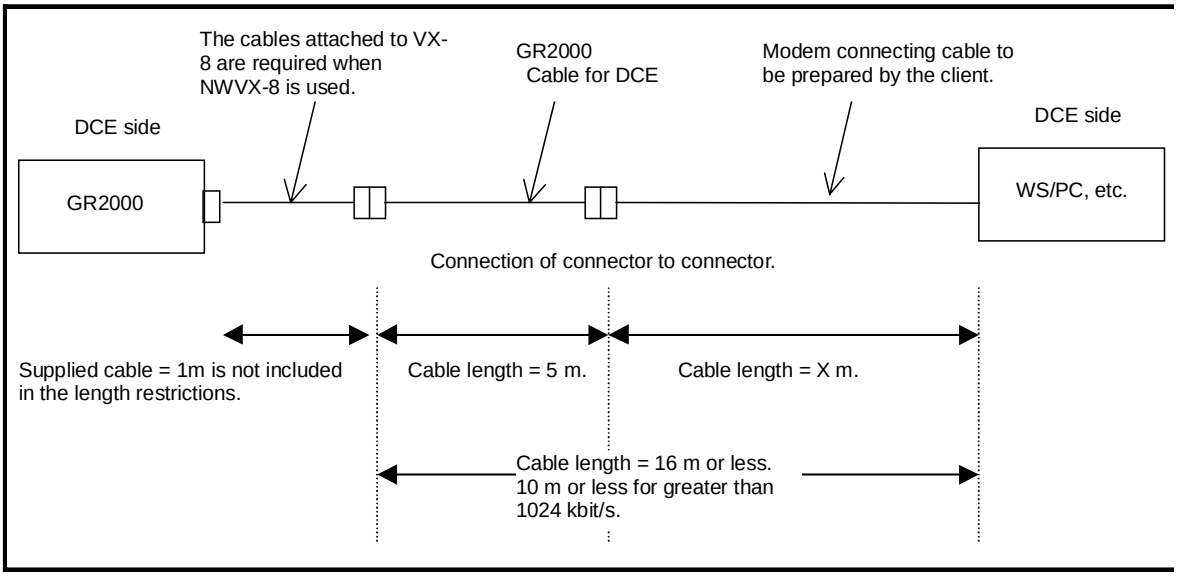

Be careful when connecting the cables attached to VX-8 to the devices that the connector insertion faces are reversed between the lower side connectors (LINE 0, LINE 1, and LINE 4, LINE 5) and the upper side connectors (LINE 2, LINE 3, and LINE 6, LINE 7).
LINE#7
LINE#6
LINE#5
LINE#4
LINE#3
LINE#2
LINE#1
LINE#0

Figure 3-74 Line numbers for the cables attached to NWVX-8


The cables attached to VX-8 are required when NWVX-8 is used.
GR2000 Cable for DCE
Modem connecting cable to be prepared by the client.
DCE side
DCE side
GR2000
WS/PC, etc.
Connection of connector to connector.
Supplied cable = 1m is not included in the length restrictions.
Cable length = 5 m.
Cable length = X m.
Cable length = 16 m or less.
10 m or less for greater than 1024 kbit/s.

shows the cable specifications.

When connecting to a TA or modem on the V.35 interface, an HN-F9355-72H cable (5m) or its option for 1m to 16m (request for price quotation basis) is applicable. The latter is required when the line speed is 6 Mbps.

As illustrated, the other-end connector has a skirt for protection of pin bends. Ensure the shape of the mating receptacle.

Line speed range (XR bit/S)	**Cable length limitation**	**Coordinating cable**
9.6 < X ≤ 1024	16m or shorter.	HN-F9355-72H (5m) Cables other than 5m are coordinated individually.
1024 < X ≤ 1536	10m or shorter.	HN-F9355-72H (5m) Cables other than 5m are coordinated individually.
1536 < X ≤ 6144	1m or shorter.	Coordinated individually.
(Note 1) It is 1536 < x ≤ 2048 in NWVX-8.		

shows the cable specifications.

When connecting to a TA or modem on the X.21 interface, an HN-F9355-73H cab (5m) or its option for 1m to 16m (request for price quotation basis) is applicable. T latter is required when the line speed is 6 Mbps.

When using the own router as a DCE and connecting to a DTE-attached cable on X.21 interface, an HN-F9355-77H cable (5m) is applicable. This direct connection allows the line speed of 768 kbps or less, and the maximum cable length of 16 m between the DCE and the DTE..

Line speed range (XR bit/S)	Cable length limitation	Coordinating cable
9.6 < X ≤ 1024 (Note 1)	16m or shorter.	HN-F9355-72H (5m) Cables other than 5m are coordinated individually.
1024 < X ≤ 1536	10m or shorter.	HN-F9355-72H (5m) Cables other than 5m are coordinated individually.
1536 < X ≤ 6144 (Note 2)	1m or shorter.	Coordinated individually.
((Note 1) It is 2.4 < x ≤ 1024 in NWVX-8. *(Note 2) It is 1536 < x ≤ 2048 in NWVX-8.*		

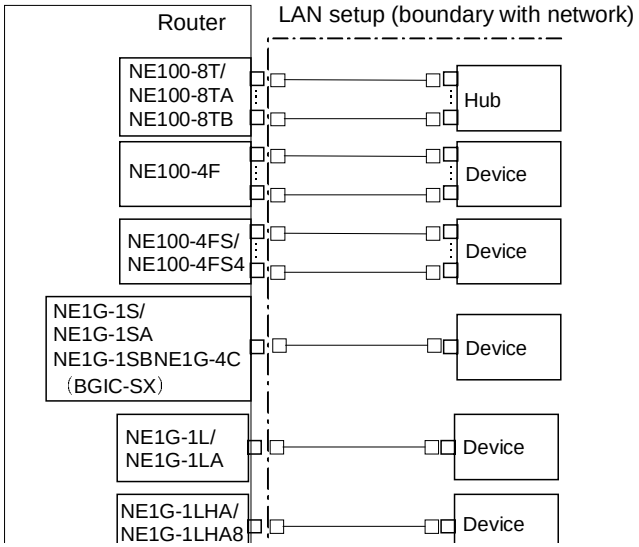
This section provides detailed specifications and recommended products for the customer-responsibility interface cables. For the V.24/V.35/X.21 cables provided as fittings, see Subsection 3.9.3.

Note: For direct connection between the router and the other end device, make sure of the connector type on the other end device which may require a different cable.

Note: The customer responsibility interface cables include multimode and single-mode optical fiber cables. Since the optical fiber cable may take various routes (e.g., outdoor pipes, ducts, troughs, bitts on utility poles and buildings, pipeshafts, racks, and garrets), special attention has to be paid for the physical structure of the optical fiber cables to be procured.

- **Make sure that the inner core fibers are duly protected from mechanical stresses (e.g., repeated bends, stretches, compressions, and rubs during the routing work) and environmental stresses.**

All the LAN interface cables are customer responsibilities. Depending on the type LAN and the distance as shown in Figure 3-82 and Table 3-95, an appropriate LA interface cable needs to be procured.



(CAT 5) cable is required. A UTP Category 3 (CAT 3) cable is applicable when connecting only to the 10BASE-T port at 10 Mbps. Figure 3-83 shows the cable specifications.

Table 3-96 Pin arrangement on the device side (10MBASE/100MBASE interface)

Pin No.	Specifications	
1	Transmit (+)	(A)
2	Transmit (-)	(a)
3	Receive (+)	(B)
4	Unused	(C)
5	Unused	(c)
6	Receive (-)	(b)
7	Unused	(D)
8	Unused	(d)
Note: Because of being a twisted pair cable, make pairs of (A) and (a), (B) and (b), (C) and (c), and (D) and (d) using the above pin assignment. For pins other than these, do not care about the pairing, either unconnected or connected can be accepted.		

an optical fiber cable with the specifications shown in Figure 3-84. One or more cables of the same type is recommended to be prepared for spare. Table 3-98 sho the router's optical interface specifications for 100BASE-FX multimode connectio

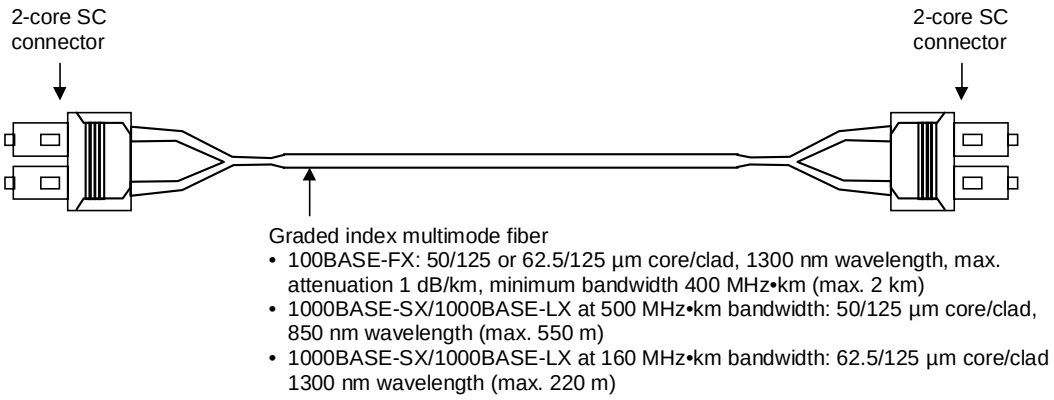
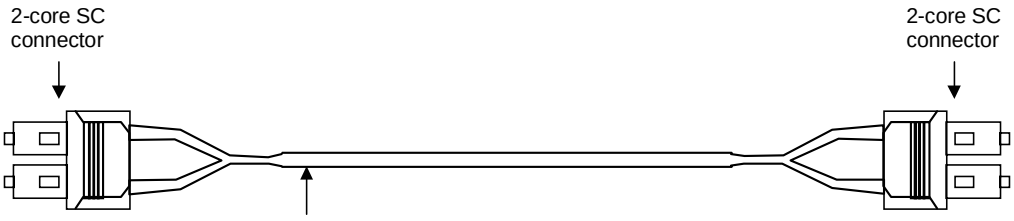

2-core SC connector
2-core SC connector
Graded index multimode fiber
• 100BASE-FX: 50/125 or 62.5/125 µm core/clad, 1300 nm wavelength, max. attenuation 1 dB/km, minimum bandwidth 400 MHz•km (max. 2 km)
• 1000BASE-SX/1000BASE-LX at 500 MHz•km bandwidth: 50/125 µm core/clad, 850 nm wavelength (max. 550 m)
• 1000BASE-SX/1000BASE-LX at 160 MHz•km bandwidth: 62.5/125 µm core/clad 1300 nm wavelength (max. 220 m)

Figure 3-84 Multimode Optical Fiber Cable Specifications for 100BASE-FX,

requires an optical fiber cable with the specifications shown in Figure 3-85. One or more cables of the same type is recommended to be prepared for spare. Table 3-99 shows the router's optical interface specifications for 100BASE-FX and 1000BASE-LH single-mode connections.

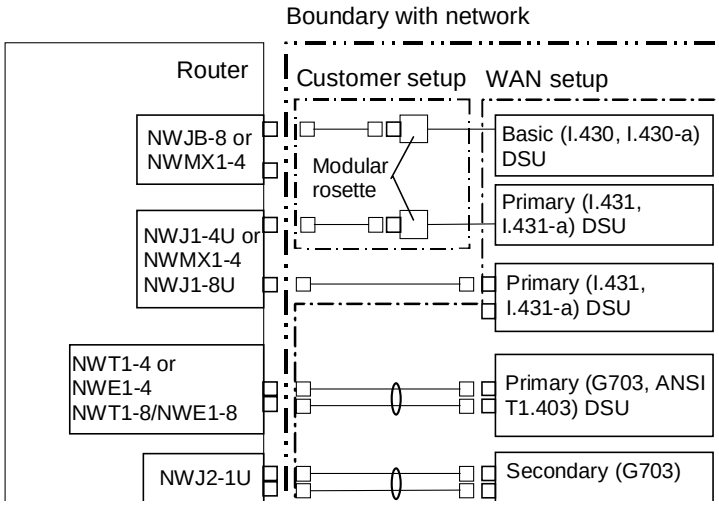


Graded index single-mode fiber

- 100BASE-FX: 9.5/125 µm core/clad, 1300 nm wavelength, max. attenuation 0.6 dB/km (max. 15 km) or 0.3 dB/km (max. 40 km)
- 1000BASE-LX: 9.5/125 µm core/clad, 1500 nm wavelength (max. 40 km, 80 km, 100 km
- 1000BASE-LH: 9.5/125 µm core/clad, 1500 nm wavelength, max. attenuation 0.3 dB/km (max. 70 km)

Boundary with network: router's connector

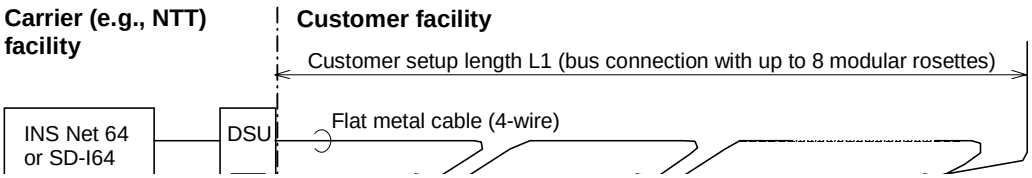
The WAN interface cables except those supplied as fittings (V.24, V.35, and X.21 cables) are customer responsibilities. Depending on the type of WAN and the distance as shown in Figure 3-86 and Table 3-100, an appropriate WAN interface cable needs to be procured.

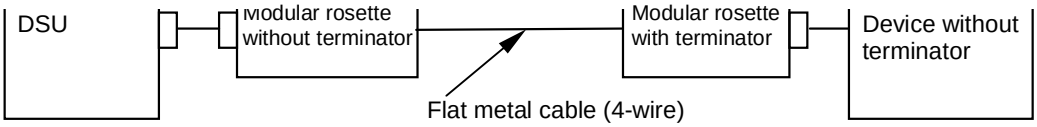


Interface	Connection		Approx. Width (mm)	Length (m)		Q'ty/ NIF	Cable Type
	From	To		Min.	Max.		
Basic (I.430, I.430-a)	Router	Modular rosette	6	–	16	1–8	UTP
Primary (I.431, I.431-a)	Router	Modular rosette/ DSU	6	–	16	1–4	UTP
Primary (T1/E1)	Router	DSU	6	–	1800	1–4	UTP
Secondary (G.703)	Router	DSU	6	–	16	2	Metal (coaxial)
Tertiary (T3/E3)	Router	DSU	6	–	137	2 or 4	Metal (coaxial)
OC-3c/STM-1 (POS) MMF	Router	Device/ Box	6 (long), 4 (short)	0.5	2k	1	Multimode optical fiber
OC-3c/STM-1 (POS) SMF	Router	Device/ DSU	8 (long), 5 (short)	0.5	15k	1	Single-mode optical fiber
OC-12c/STM-4 (POS)	Router	Device/ DSU	8 (long), 5 (short)	0.5	15k	1	Single-mode optical fiber
OC-48c/STM-16	Router	Device	–	0.5	2k	1	Single-mode optical fiber

Pin No.	Specifications
1	Unused
2	Unused
3	Transmit (+)
4	Receive (+)
5	Receive (+)
6	Transmit (-)
7	Unused
8	Unused

Note: Because of being a twisted pair cable, make pairs of (A) and (a), and (B) and (b) using the ab pin assignment. For pins other than these, do not care about the pairing, either unconnected or connected can be accepted.


Carrier (e.g., NTT) facility
Customer facility
Customer setup length L1 (bus connection with up to 8 modular rosettes)
INS Net 64 or SD-I64
DSU
Flat metal cable (4-wire)



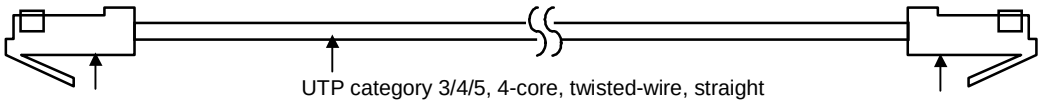
Note: This connection requires costs for extra connection work and modular rosette in addition to those for ordinary cabling and DSU setup. For details of the connection work, consult the carrier (e.g., NTT).

Figure 3-89 Connection to Device without Terminator

3.10.2.2 UTP Cable for Primary (I.431 or I.431-a)

For connection to the Primary (I.431 or I.431-a) interface, a UTP Category 3, 4, or 5 cable shown in Figure 3-90 is required. Figure 3-91 shows an example of indirect connection between the router and the DSU via a modular rosette on this interface.

For indirect connection to DSU via modular rosette



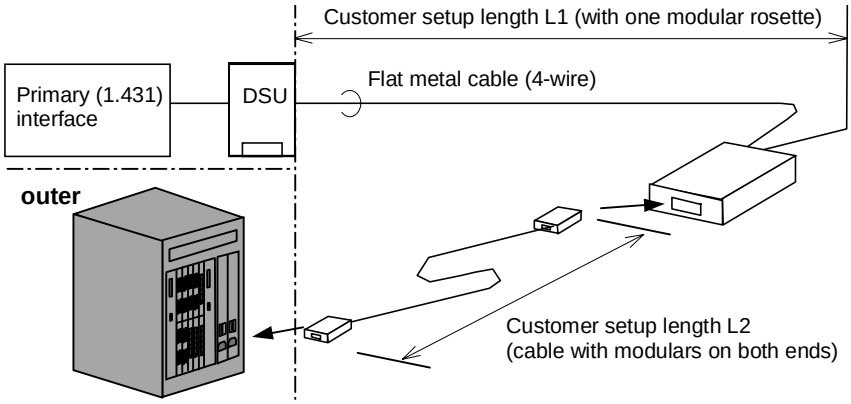


Figure 3-91 Sample Indirect Connection with Primary (I.431 or I.431-a)

Configuration Notes:

- *Customer setup length L1, i.e., the total length of flat metal cables, should not exceed 16 m - L2. addition, be sure to use the flat metal cable with the core diameter of 0.65 mm.*
- *The modular rosette is the customer responsibility, and hence not included in the router. Procure that has the model name MJ-8S (no terminator).*

Pin No.	Function (device side)		Function (DSU side)	
1	Unused		Transmit (+)	(B)
2	Unused		Transmit (-)	(b)
3	Transmit (+)	(A)	Unused	
4	Receive (+)	(B)	Receive (+)	(A)
5	Receive (+)	(b)	Receive (+)	(a)
6	Transmit (-)	(a)	Unused	
7	Unused		Unused	
8	Unused		Unused	
Note: Because of the cable being a twist pair cable, make pairs of (A) with (a), and (B) with (b) in the above pin assignment. For other cables than these, there is no need of worrying about the pairing, either of being connected or unconnected can be accepted.				

3.10.2.4 Metal (Coaxial) Cable for Secondary (G.703)

For connection to the Secondary (G.703) interface, a send-and-receive pair of metal (coaxial) cables are required per port (DSU). Figure 3-93 shows the cable specifications. Be noted that neither the single cable length nor the total length of the

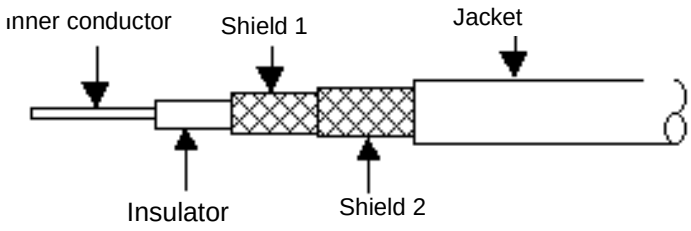
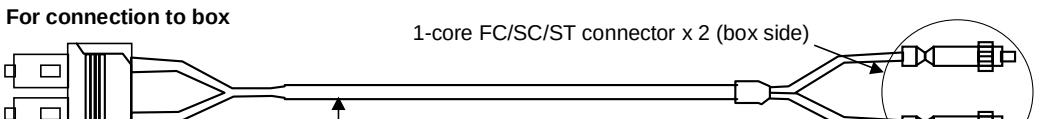
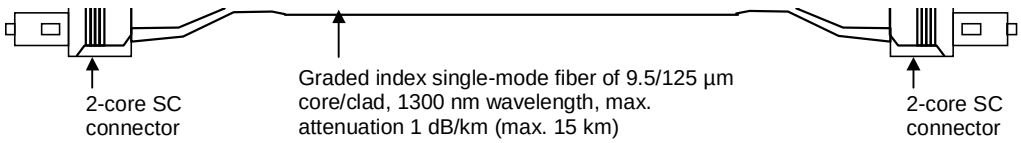


Figure 3-95 Construction of duel shield type coaxial cable

3.10.2.6 Multimode Optical Fiber Cable for OC-3c/STM-1 (POS) MMF

Multimode connection with the OC-3c/STM-1 (POS) MMF interface requires an optical fiber cable with the specifications shown in Figure 3-96. One or more cab of the same type is recommended to be prepared for spare.

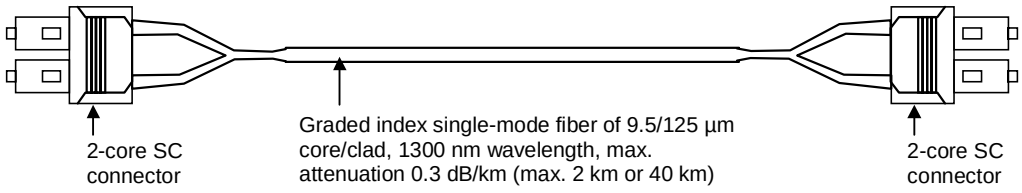




Recommended model name: Hitachi Optical Fiber Cable SM1005-2F-C2SC-[ ]M (cord length in brackets)
Boundary with network: router's connector

Figure 3-97 Single-Mode Optical Fiber Cable Specifications for OC-3c/STM-1 (POS) SMF and OC-12c/STM-4 (POS)

fiber cable with the specifications shown in Figure 3-98. One or more cables of th same type is recommended to be prepared for spare. Table 3-99 shows the router optical interface specifications for OC-48c/STM-16 (POS) single-mode connection


2-core SC connector
Graded index single-mode fiber of 9.5/125 µm core/clad, 1300 nm wavelength, max. attenuation 0.3 dB/km (max. 2 km or 40 km)
2-core SC connector

Recommended model name: Hitachi Optical Fiber Cable SM1005-2M-C2SC-[ ]M (cord length in brackets)
Boundary with network: router's connector

Figure 3-98 Single-Mode Optical Fiber Cable Specifications for OC-48c/STM-16 (POS

Table 3-104 Optical Interface Specifications for OC-48c/STM-16 (POS) Single-Mode Connections

	Specifications

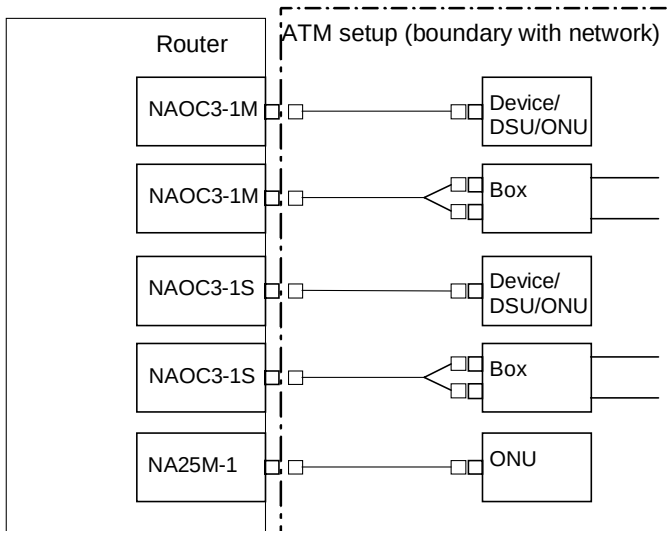
This is SM type quartz fiber optic cable with a core diameter of 8.0μm and a clad diameter of 125μm. The maximum allowable transmission distance between the devices is 80km when a fiber optic cable with a transmission loss of 0.3 dB/km (wavelength of 1550nm) or less is used.

The boundary for the NWOC48 is the connector on the side of this device.
A single mode fiber optic cable can be used for connecting with the device. A summary diagram is shown in Figure 3-99 below.
Table 3-105 shows the optical interface specification for NWOC48.

O21: [Direct connection between devices]

Recommended model name:
Hitachi Optical Fiber Cable C-2DSF0803(2)(D)#S/P/0. 2# [ ] M : 2-core SC connector – 2-core SC connector. (core length in brackets)

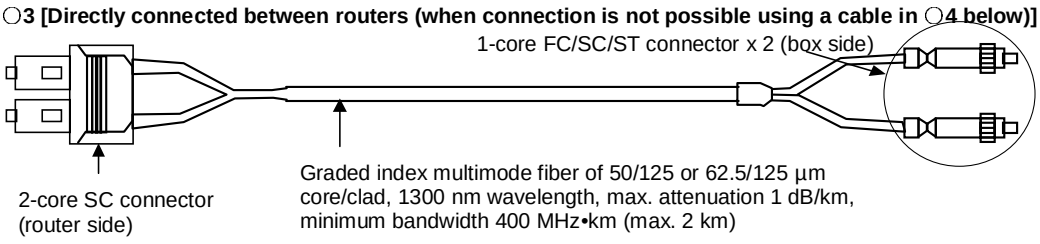
All the ATM interface cables are customer responsibilities. Depending on the type ATM and the distance as shown in Figure 3-100 and Table 3-106, an appropriate ATM interface cable needs to be procured.



optical fiber cable. Figure 3-94 shows the cable specifications, which are the same as those for the OC-3c/STM-1 (POS) MMF interface (Subsection 3.10.2.6). One or more cables of the same type is recommended to be prepared for spare.

The boundary with ATM (OC3) is used as a connector on this router's side.

A multimode optical fiber is used for connection with the router. Figure 3-101 shows the schematic diagram. This router's optical interface specifications are shown in Table 3-107.

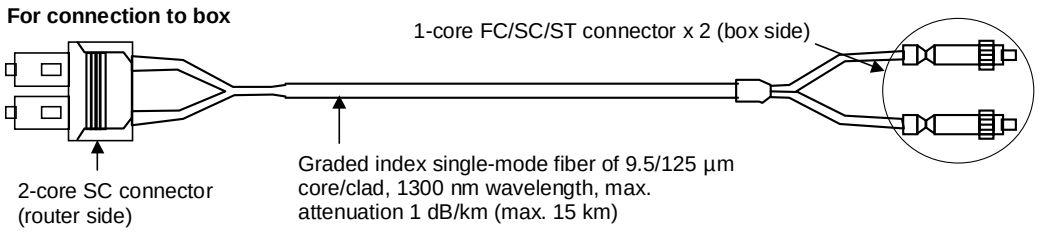

○3 [Directly connected between routers (when connection is not possible using a cable in ○4 below)]
1-core FC/SC/ST connector x 2 (box side)
2-core SC connector
(router side)
Graded index multimode fiber of 50/125 or 62.5/125 µm
core/clad, 1300 nm wavelength, max. attenuation 1 dB/km,
minimum bandwidth 400 MHz•km (max. 2 km)

Boundary with network: router's connector

optical fiber cable with the specifications shown in Figure 3-102. One or more cab of the same type is recommended to be prepared for spare.

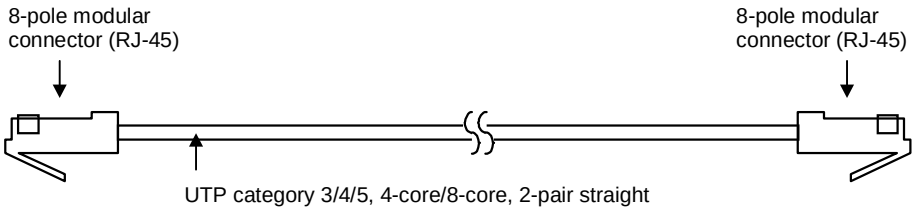
The boundary with ATM (OC3) is used as a connector on this router's side.

A multimode optical fiber is used for connection with the router. Figure 3-102 sho the schematic diagram. This router's optical interface specifications are shown i Table 3-108.


For connection to box
1-core FC/SC/ST connector x 2 (box side)
2-core SC connector
(router side)
Graded index single-mode fiber of 9.5/125 µm
core/clad, 1300 nm wavelength, max.
attenuation 1 dB/km (max. 15 km)

Boundary with network: router's connector

Figure 3-103 shows the cable specifications.



Recommended model name: Hitachi UTP Cable C5E-PCTA-P8/P8-[ ]M (cord length in brackets)
Boundary with network: router's connector

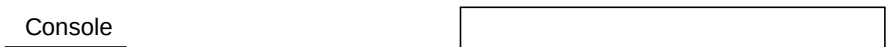
Figure 3-103 UTP Cable Specifications for 25Mbps ATM

Precautions in Planning Installatio

4.1 Prerequisites

4.1.1 Local Setup Console and Remote Operation Terminal

Figure 4-1 illustrates the local setup console and remote operation terminals to b procured by the user. Description of each type follows.



For the operation thereafter, a console or a remote operation terminal is required. The console shall use a terminal connected to RS232C, and the remote operation terminal shall use a terminal connected via IP network to remotely log in with this device by using telnet or rlogin, or log-in connected through the web browser. In addition, it is coordinated also with the network management by using the SNMP manager via the IP network. The connection patterns of the operation terminal are shown in Fig. 27-1: The connection patterns of the operation terminal, and the conditions for the remote operation terminal connection port and the operation terminal are shown in Table 27-2: The operation terminal conditions.

Table 4-1 The operation terminal conditions

Terminal type	Connection patter	Required function
Console	RM serial connection (RS232C) (Note 1) (Note 2)	RS232C(Line speed: 19200, 9600, 4800, 240, 1200) ZMODEM procedure (Note 6) (Line speed: 9600) ZMODEM procedure (Note 6)
	RM serial connection (Modem)	RS232C (Line speed: 9600)

9-pin on Router Side		Connection	9-pin on Setup Console Side	
Pin Number	**Signal Name**		**Pin Number**	**Signal Name**
5	SG		5	GND
3	SD		2	RX
2	RD		3	TX
7	RS		1	DCD
8	CS		8	CTS
1	CD		7	RTS
6	DR		6	DTR
4	ER		4	DSR

Note 3:
In order to connect the RM serial interface of this device with a modem, use a straight cable to conn the AT interchangeable machine and the modem.

Note 4:
The model connected to this device is set to the automatic signal reception.

reception	received automatically.	
Setting when reset	The setting is read out from the non-volatile memory in the modem.	AT&Y0
Saving the setting	The setting is saved in the non-volatile memory in the modem.	AT&W0

Note 5:
Perform dialing by using the dial function of the terminal software. For the dial setting, refer to the operation manual for the terminal software.
Dial connection is possible by using the AT command from the terminal. Dialing is performed by using the AT command for a case of using a terminal software having no dial function. For the method of dialing by using the AT command, refer to the operation manual for the modem. An example is shown below.
Example: When dialing by using the Hayes interchangeable AT command.

- Dialing to 123-4567 on tone by using the public line
- Dialing to 123-4567 on tone by using the private branch-exchange.
- Dialing to 123-4567 on tone by using the private branch-exchange after dialing zero and waiting for a few seconds.

Note 6:
A CD-ROM is required when performing replacement of the software by using this terminal.

Note 7:
For the dial-up IP connection procedure, refer to the "Operation guide, 3.11: Dial-up IP connection".

or workstation connected to the IP network. This SNMP Manager program and its vehicle are option to GR2000 and to be prepared by the user.

Other than the IP network connectivity and the hardware requirements specified the software, the personal computer or workstation for SNMP Manager has no particular requirement.

SNMP Manager, on the other hand, has certain requirements, recommendations, and restrictions as shown below.

- SNMP Manager version requirements: The router supports SNMPv1 (RFC115 To perform network management using SNMP manager, use SNMPv1.
- Recommended product: Functionality of the following SNMP manager program is proven on this router and hence recommended. If you use any other SNMP manager program, check out its functionality before use.
  - SNMP Manager
    - HP OpenView Network Node Manager Ver4.0x (HP-UX version)
    - HP OpenView Network Node Manager Ver5.01 (HP-UX version)
    - HITACHI NETM*Cm2 Ver04-0x (HI-UX and HP-UX versions, Japan on
    - HITACHI NETM*Cm2 Ver05-00 (HP-UX and WindowsNT versions, Jap

line speed is slow.

- A case of too many number of the connected IP network or connected interface.
  For example, a case where the number of interface of the device is too many, or a case where retrieval of the IP related MIB information takes excessive amount of time.
- A case of too many number of too many entries in routing table.
  For example, in case where the number of IP routing entries in the device is too many, retrieval of the IP related MIB information takes excessive amount of time, or MIB response drop occurs due to reduction of the CPU allotment time to retrieve the MIP information by route calculations.
- A case of too many number of ARP.
  A case where retrieval of the IP related MIB information takes excessive amount of time if the number of ARP of this device is too many.
- A case of too many number of connected SNMP manager.
  For example, a case where the number of SNMP manager to be connected to this device is too many, and collection of the MIB information concentrates in a certain length of time.

- Review of the collection cycle of the MIB information in the SNMP manager.
  This device increases the amount of management information (MIB) in

Within the maximum configuration defined in Section 2.4, “Device Components,” GR2000 has certain configuration limits as described below.

4.2.1 RP

Three types of RPs, RP-A1, RP-C and RP-D apply to specific GR2000 models as shown in Table 4-6.

- RP mounting conditions
  - RP mounting conditions by each model
    RP mounting conditions by each model are shown in Table 9-2: The RP mounting conditions by each model.

Table 4-4 The RP mounting conditions by each model

Model RP	GR2000-2S	GR2000-4S	GR2000-6H	GR2000-10H	GR2000-20
RP-A1	X	O	O	O	O
RP-CRP-C6	X	X	O	-- (Note 1)	-- (Note 2)
RP-DRP-D6	X	O	O	O	O

Model	Mounting number of RP-A1	Mounting number of RP-C, RP-C6	Mounting number of whole RP
GR2000-10H (100V AC input)	5 or less	0	5 or less
	4 or less	1	5 or less
	3 or less	2	5 or less
GR2000-20H (100V AC input)	10 or less	0	10 or less
	9 or less	1	10 or less
	6 or less	2	8 or less
	4 or less	3	7 or less
	1 or less	4	5 or less
The following models have no mounting limitation due to mounting of RP-C: • GR2000-6H • GR2000-10H used in 200V AC or 48V DC • GR2000-20H used in 200V AC or 48V DC			

Table 4-6 Applicable Types and Quantities of RPs by Router Model

NIFs apply to specific RP types and specific GR2000 models as shown i-- Table 4-

Table 4-7 Quantities of NIFs by Router Model

NIF Type			Application to RP Type*			Max. Q'ty per Router Model				
Inter-face	Board Size	NIF Name	RP-A1**	RP-C, RP-C6 and RP-CV	RP-D, RP-D6 and RP-DV	GR2000-2S	GR2000-4S	GR2000-6H	GR2000-10H	
LAN	Half	NE100-8T	Yes	No	Yes	2	4	6	10	
		NE100-8TA	Yes	No	Yes	2	4	6	10	
		NE100-8TB	Yes	No	Yes	0	4	6	10	
		NE100-4F	Yes	No	Yes	1	2	6	10	
		NE100-4FS	Yes	No	Yes	1	2	6	10	
		NE100-4FS4	Yes	No	Yes	1	2	6	10	
	Full	NE1G-1S	Yes	No	Yes	0	1	3	5	
		NE1G-1SA	Yes	No	Yes	0	1	3	5	
		NE1G-1SB	Yes	No	Yes	0	1	3	5	
		NE1G-1L	Yes	No	Yes	0	1	3	5	

		NWOC12-1SD	No	No	Yes	0	1	3	5	10
		NWOC12-4S	No	Yes	No	0	0	3	5	10
		NWOC48-1S	No	Yes	No	0	0	3	5	10
		NWOC48-1S4	No	Yes	No	0	0	3	5	10
		NWOC48-1S8	No	Yes	No	0	0	3	5	10
		NWOC48-1A	No	Yes	No	0	0	3	5	10
		NWOC48-1A4	No	Yes	No	0	0	3	5	10
		NWOC48-1A8	No	Yes	No	0	0	3	5	10
	Full	NAOC12-2M	No	Yes	No	0	0	3	5	10
		NAOC12-2S	No	Yes	No	0	0	3	5	10
		NAOC3-8M	No	Yes	No	0	0	3	5	10
		NAOC3-8S	No	Yes	No	0	0	3	5	10
ATM	Half	NAOC3-1M	Yes	No	Yes	1	2	6	10	20
		NAOC3-1S	Yes	No	Yes	1	2	6	10	20
		NA25M-1	Yes	No	Yes	1	2	6	10	20

* *When an NIF is installed with not applicable RP type, a log message is output and the NIF's initial setup is not activated.*

***Also assumes its equivalent integrated in GR2000-2S, if applicable, as RP-A1.*

Increment unit	GR2000-2S	GR2000-4H, GR2000-6H BCU-S300S BCU-H300H BCU-M300H BCU-L300H	GR2000-10H, GR2000-20H BCU-S850S BCU-H850H BCU-M850H BCU-L850H
Base	64MB	128M	256MB
Add One MS64	128MB	---	
Add One MS128	---	256MB	---
Add Two MS128s and Remove Base (64MB)*	256MB	---	

* *Removed base memory of BCU can be utilized for RP memory increment.*

Table 4-9 RP Memory Increment by RP Type

RP Type	Resulting Memory Capacity MB		
	Base	Add One MS64	Add One MS1
RP-A1 or equivalent	32	96	Not applicab

4-11.

Table 4-11 100BASE-FX Line Accommodation

Router Model	Max. No. of Lines		
	Per NIF	Per RP	Per Router
GR2000-2S	4	4	4
GR2000-4S	4	8	8
GR2000-6H	4	8	24
GR2000-10H	4	8	40
GR2000-20H	4	8	80

4.2.4.3 Line Accommodation with WAN (Other than ISDN and Overload)

The circuit accommodation conditions indicated below apply to WAN circuits of 6Mbit/s or less and 34Mbit/s E3 multiplex circuits (other than ISDN).

6Mbit/s or less WAN circuit accommodation conditions

In regard to 6Mbit/s or less WAN circuit accommodation conditions, accommodation

Condition		Max. Throughput kbps per
QoS	**Use of WAN Protocol on Subject RP**	
Disabled	When only PPP is used (non-multiplex)	32,500
	When only PPP is used (multiplex)	26,000
	When only frame relay is used	25,900
	When PPP and frame relay are used	25,900
Enabled without kbps-based minimum bandwidth guarantee	When only PPP is used	14,500
	When only frame relay is used	14,500
	When PPP and frame relay are used	14,500
Enabled with kbps-based minimum bandwidth guarantee	When only PPP is used	14,500
	When only frame relay is used	- **
	When PPP and frame relay are used	- **

** Calculations are based on 128-byte packets.*
*** Frame relay does not support kbps-based minimum bandwidth guarantee.*

Table 4-15 E3 Multiplex Line Accommodation per RP-D at Line Speed of 34 Mbps

Condition		Max. Throughput kbps per

Table 4-17 WAN (ISDN) Line Accommodation Limit

Condition: QoS	Max. Throughput kbps per RP*
Must be disabled	12,288
* *Calculations are based on 128-byte packets.*	

4.2.4.5 Line Accommodation with WAN (Overload)

Line accommodation with WAN (overload) is limited as shown in Table 4-18. For the multilink protocol type, the line accommodation varies with the overload configurations illustrated in Figure 4-2, and the resulting accommodations are shown in Table 4-19 through Table 4-22.

Table 4-18 WAN (Overload) Line Accommodation Limits

Protocol Type	Throughput at Inter-RP Overload		Throughput at Intra-RP Overload	
	Full Duplex	Half Duplex	Full Duplex	Half Duplex

Number of Links per Bundle	Throughput (pps)	No. of Bundles per RP (128-byte Convers
2	1,384	13
3	1,128	7
4	920	5
5	860	4
6	750	3
Note: An overhead of 12 bytes is to be added to each link.		

Table 4-20 Multilink Overload Line Accommodation Limit: Inter-RP, Half Duplex, 64kbps Bundled

Number of Links per Bundle	Throughput (pps)	No. of Bundles per RP (128-byte Conversi
2	2,600	24
3	1,824	12
4	1,700	9
5	1,680	7

connected using the same bus. Accommodate in the range where the total of each line speed does not exceed 600M bits/s. NIF1 is not restricted by a bus and each NIF can be accommodated to the maximum. The shared-bus structure of GR2000-2S is shown in Figure 4-3. NIF0 and NIF1 in the figure indicate the slot of NIF.

See the accommodation conditions in Table 4-10 when using 100BASE-TX. See the accommodation conditions in Table 4-11 when using 100BASE-FX.

An implementation example is given below. (For 10BASE-T/100BASE-TX and 100BASE-FX, calculate in full duplex.)

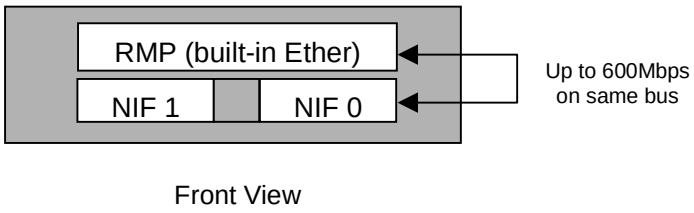
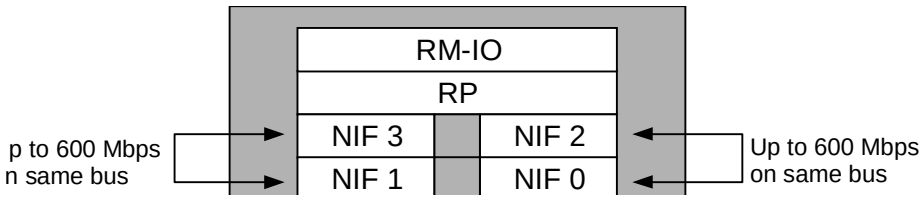


Figure 4-3 Shared Structure of GR2000-2S

and GR2000-4. On these router models, NIF0 and NIF2 connect with each other v bus, and NIF1 and NIF3 connect with each other via the other bus. The aggregat line speed of NIF0 and NIF2, and that of NIF1 and NIF3, must not exceed 600 Mb Figure 5-19 illustrates this shared-bus structure. Detailed description follows.

Table 4-23 Restriction on Aggregate Line Speed for GR2000-4S and GR2000-4

Condition	Max. Aggregate Line Speed Mbps
Per Bus (NIF0+NIF2 or NIF1+NIF3)	600
Per device	1,200



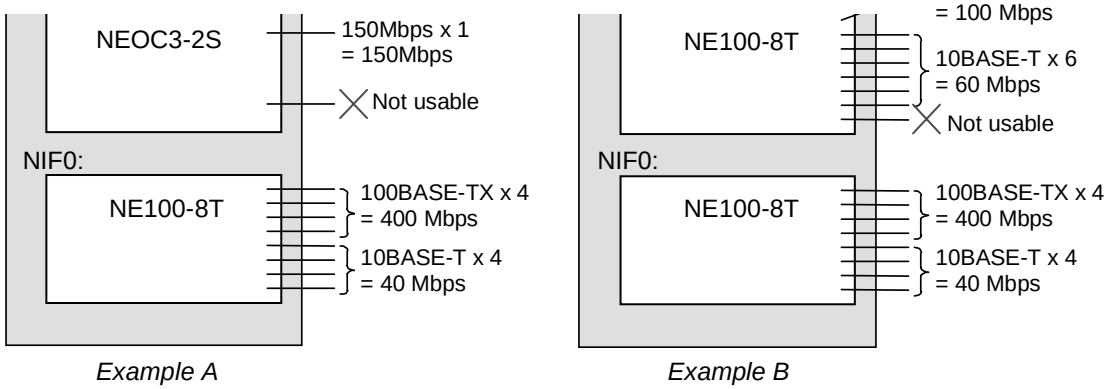


Figure 4-5 Half-Size NIF Installation Examples

Example when half-size and full-size NIFs are to be installed

Two slots must be used to install full-size NIFs. The load on each slot depends on whether it is located-receiving side or sending side. Determine the line capacity according to Table 4-24 below. For example, if NE1G-1LA is installed in NIF0+NIF1, the line speed allowed for NIF2 and NIF3 will be as follows:

Table 4-25 shows the accommodation conditions in the same RP in Ethernet. Table 4-26 shows the accommodation conditions in the same NIF, and Table 4-27 shows those in the same line.

- Functions that can be operated by Ethernet are as follows:

  VRRP, MPLS, Tag-VLAN(IPv4) (Note1), Tag-VLAN(IPv6) (Note1), bridge protoco multihome, IP protocol, IPv6 protocol, IPX protocol, IPv4 multicast, IPv6 multicast, and non- Tag-VLAN.

Table 4-25 Accommodation Conditions in the Same RP and Different NIF

Item	VRRP	MPLS	VLAN (Note 1)	Bridge	Non-VLAN	IP multicast	IPv
VRRP	√	√	√	√	√	√	√
MPLS	√	√	√	√	√	x	x
VLAN(Note 1)	√	√	√	√	√	x	x
Bridge	√	√	√	√	√	√	√
Non-VLAN	√	√	√	√	√	√	√
IP multicast	√	x	x	√	√	√	√
IPv6	√	x	x	√	√	√	√

(Note 1) The number of VLANs is especially limited when VLAN is used. For details, see the "Maximum number

Item	Per router	Per RP	Per line
VLAN	In case of BCU-300H, BCU-N300H, and BCU-L300H: 256 In case of BCU-850H, BCU-M850H, and BCU-L850H: 256Å~RP	256	256

4.2.4.9 Line accommodating conditions for ATM

- Accommodating conditions for OC-12c/STM-4 ATM

  NAOC12-2M and NAOC12-2S can accommodate two lines, but for the total speed value, follow the accommodating conditions described below. Table 3-23: Accommodating conditions for NAOC12-2M and NAOC12-2S

Table 4-29 Accommodating conditions for NAOC12-2M and NAOC12-2S

Accommodating conditions		Statement
299200kbps/Line	599000kbps/NIF	• Make the CBR peak cell rate of IVP per line

Shown here is the maximum number of peers that can be connected to GR2000 through LAN, frame relay, or ATM network. The peer includes not only routers bu also terminals.

4.2.5.1 Maximum Number of ARP Entries

In the LAN, frame relay, or ATM network, the hardware address corresponding to destination address of the packet is determined by the address resolution protoc such as ARP and InverseARP. Consequently, the maximum number of peers on t said network media is determined by the maximum number of ARP entries. See Table 4-31 for the maximum number of ARP entries for each GR2000 model.

Table 4-31 Maximum Number of ARP Entries

Router Model	Maximum No. of ARP Entries		
	Per Interface	Per RP	Per Router
GR2000-2S	4096	4096	4096
GR2000-4S	4096	4096	4096
GR2000-6H	4096	4096	12,288 (4096×3)

Router Model	Maximum Number of VCs				
	Per Line	Per NIF	Per Interface	Per RP	Per Router
GR2000-2S	2,048	2,048	64	4,096	4,096
GR2000-4S	2,048	2,048	64	4,096	4,096
GR2000-6H	2,048	2,048	64	4,096	4,096
GR2000-10H	2,048	2,048	64	4,096	4,096
GR2000-20H	2,048	2,048	64	4,096	4,096

4.2.6 Maximum Number of Interfaces and Multihome Subnets

4.2.6.1 Maximum Number of Interfaces

The number of units to which IP addresses are given is called the number of interfaces. See Table 4-34 for the maximum number of interfaces. The values shown are for the communication interfaces and hence do not count the RM Ethernet connection interface for the router management. In addition, the maximum number of interfaces assumes static routing. For the case of dynamic routing such as RIP or OSPF, the effective number of interfaces largely depends on the route calculation performance of the subject protocol.

4.2.7.1 Maximum Number of Neighbor Routers

Definition of the maximum number of neighbor routers varies with routing protoc as shown below. Table 4-36 shows the maximum number of neighbor routers ba on the definition by each routing protocol.

- For static routing, the number of next hop addresses.
- For RIP, the number of interfaces on which RIP operates.
- For OSPF:
  - In a network where this router is the OSPF designated router, the numbe all the other OSPF routers in the network.
  - In a network where this router is not the OSPF designated router, the num of interfaces on which OSPF operates.
- For BGP4, the number of BGP peers.

Table 4-36 Maximum Number of Neighbor Routers

Routing Protocol	Maximum Number of Neighbor Routers
Static routing	3584

Routing Protocol	No. of Higher Peers*	Installed Memory	Max. No. of Route Entries**	Max. No. of Neighbor Peers***	
				Multipath Not Used	Multipath Used
BGP4	2	256MB	120,000	3	1
		512MB	120,000	16	14
			160,000	10	8
		768MB	120,000	31	29
			160,000	21	19
	3	512MB	120,000	14	12
			160,000	8	6
		768MB	120,000	29	27
			160,000	19	17
	4	512MB	120,000	12	10
		768MB	120,000	27	25
			160,000	17	15

*(1) * "No. of Higher Peers" means the number of peers that notifies the own router of the maximum number of route entries.*
*(2) ** Includes alternate routes.*
*(3) *** "Max. No. of Neighbor Peers" means the number of peers to which the own router sends the*

The number of interfaces and routing table entries capable of defining IP multica are shown in Table 4-40. This device supports PIM-DM, PIM-SM and DVMRP as multicast routing protocols. Also, the PIM-DM and DVMRP protocols do not oper simultaneously.

Table 4-40 IP Multicast Accommodation Limits

Item	Max. Limit
No. of PIM-DM multicast interface *	256 per router
No. of DVMRP multicast interface * **	32 per router
No. of PIM-SM multicast interface *	31 per router
No. of PIM-DM/DVMRP multicast routing entries (S, G)** S: Source IP address G: Group address	10,000 per router
No. of PIM-SM multicast routing entries (S, G) and (*, G) S: Source IP address G: Group address	1000 per router
No. of IGMP member groups***	256 per router
No. of neighbor multicast routers	256 per router
No. of static member groups****	128 per router
No. of DVMRP tunnel interface (Tunneling interface can be defined only with DVMRP.)**	32 per router

Table 4-41 and Table 4-42 show the IPX and Bridge accommodation limits.

Table 4-41 IPX Accommodation Limits

Router Model	Max. No. of Static ARP Entries	Max No. of IPX Interfaces		Max. No. of Routing Table Entries[1]
		Per RP	Per Router	
GR2000-6H	256/device	32	96	1,000
GR2000-10H	256/device	32	160	1,000
GR2000-20H	256/device	32	160	1,000

[1] *Total of static and dynamic entries.*

Table 4-42 Bridge Accommodation Limits

Router Model	Max. No. of Bridge Interfaces		Max. No. of Filtering Database Entries[1]
	Per RP	Per Router	
GR2000-6H	32	96	2,000
GR2000-10H	32	160	2,000

maximum number of dynamic entries and static entries. Use the device so that t total value of dynamic and static entries does not exceed the maximum number o entries for the device. Using the device at the maximum entry capacity requires mounted memory amount shown in "(3) Minimum required memory".

Table 4-44 Maximum Number of Dynamic and Static Entries

Item	Maximum Limit		
	Total	Dynamic	Static
IP unicast route entries	2,000,000/router	2,000,000/router	3,000/router
IP multicast route entries	10,000/router**	10,000/router**	-
ARP entries	4,096/RP*	4,096/RP*	4,096/router
IPX routing table entries	1,000/router	1,000/router	200/router
IPX ARP entries	256/router	-	256/router
Bridge filtering database entries	2,000/router	2,000/router	500/router

** Total maximum per router is determined by number of installable RPs for the target router model.*
*** It will be 1000/device in the case of PIM-SM.*

up the MPLS network must be RP-D, RP-DV or RP-C, RP-CV. RP-A and RP-A1 will not operate.

In addition, in regard to the conditions of NIFs that support MPLS functions, NIF conditions that accommodate MPLS backbone circuits are shown in Table 4-47 and NIF conditions that accommodate MPLS access circuits are shown in Table 4-51 Refer to Figure 4-7 for the location of MPLS backbone and access circuits.

There are non-utilizable RP types depending on the mode of the MPLS protocol used. These are shown in the table below.

Table 4-46 Protocol types in MPLS and non-utilizable RP types

MPLS protocol mode and IP-VPN system	Configuration defining mpls information protocol parameter setting	RP-C, RP-D	RP-CV, RP-DV
LDP(DoD)/CR-LDP mode, LSP allocation system for each VPN	cr-ldp	O Usable.	O Usable.
LDP (DU) mode, RFC2547 bis system	ldp-unsolicited	X Not usable.	O Usable.

Category	NIF Name	MPLS Support (*1)		RP
		Backbone circuit	Access circuit	
LAN	NE100-8TA	x	√	D, DV
	NE1G-1LA	x	√	D, DV
	NE1G-1SA	x	√	D, DV
	NE1G-1LHA	x	√	D, DV
	NE1G-1LHA8	x	√	D, DV
	NE100-8TB	√	√	D, DV
	NE1G-1LB	√	√	D, DV
	NE1G-1SB	√	√	D, DV
	NE1G-1LHBA	√	√	D, DV
	NE100-4F/4FS/4FS4	x	√	D, DV
	NE1G-4C	√	√	C, CV
WAN	NWVX-4	x	√	D, DV
	NWVX-8	x	√	D, DV
	NWJB-8	x	√	D, DV
	NWJ1-4U	x	√	D, DV
	NWJ1-8U	x	√	D, DV

	NAOC3-8M	x	√	C, CV
	NAOC3-8S	x	√	C, CV
	NAOC12-2M	√	√	C, CV
	NAOC12-2S	√	√	C, CV

*(*1) √: Supported x: Not supported*
*(*2) Only PPP is supported. FR is not supported. Only clear channel is supported.*
*(*3) In the LDP (DU) mode, the ATM lines are outside the object of support for the backbone line.*

4.2.11.3 Memory Card Unit (MC)

When using MPLS functions, MC card must be MC64 and MC30 will not operate.

4.2.11.4 Minimum Memory Requirements

Minimum required memory is shown on the number of route entries for IPv4 unicast, the number of routers constituting the MPLS net, and the number of supported VPNs. Table 4-48: The minimum required BCU memory in LDP (DU) mode and RFC2547 bis system shows the basic control unit (BCU) in the case of LDP (DU) mode and RFC2547 bis system, Table 4-49: The minimum required BCU memory in

BCU memory size	IPv4 unicast				No. of ATM V per NIF
	---	Path entry count			
		Maximum number of entries by protocols			
		RIP+OSPF	BGP4 (Note 2)	Statics	
128MB or more	2,000 or less	2,000	--	500 or less	256 or les
256MB or more	22,000 or less	2,000	20,000	500 or less	2,048 or les
512MB or more	83,000 or less	3,000	80,000	1,000 or less	2,048 or les
768MB or more	125,000 or less	5,000	120,000	1,000 or less	2,048 or les
(Note 1)	(Note 3) (Note 4) (Note 5) (Note 6)				

(Note 1) If the basic control unit is duplicated, it is necessary to expand the memory so as to achieve the minimu required memory amount for both the operating RM and the standby RM.
(Note 2) The minimum required memory to operate the MPLS and the BGP4 simultaneously is 256 MB for BCU 128 MB for RP. If the VPN function of RFC2547 bis system is used, it is necessary to operate the BGP4 simultaneously because the route information of VPN is carried through the MPLS backbone net by using the BG
(Note 3) The number of route entries includes that of the static route, direct route, summarization route, default ro and loop back route.
(Note 4) The number of route entries includes that of the alternate route.
(Note 5) For the relationship between the number of route entries and the number of adjacent router/adjacent pe

MPLS protocol mode	Routing processor module (RP) memory	IPv4 unicast path entry count	IPv4 multicast path entry count	ATM VC count per NIF	Min. band guarantee with kbit/s designated
LDP (DU) Mode	64MB or more	2,000 or less	unused	256 or less	no
	128MB	125,000 or less	unused	2,048 or less	yes
LDP (DoD)/ CR-LDP Mode	64MB or more	2,000 or less	unused	256 or less	no
	128MB	90,000 or less	unused	2,048 or less	yes
		(Note 1) (Note 4)		(Note 2)	(Note 2) (Note 3)

**1 It is necessary to increase the memory of all RPs installed in the device.*
**2 It is necessary to increase memory so that the minimum required memory is provided only for the relevant RPs (the memory required for each RP differs).*
**3 Min. band guarantee with kbit/s designated is a QoS queue attribute of configuration definition data in WAN (6Mbit/s or less, excluding ISDN) and is a mode that is designated by the bandwidth_kbps parameter.*
**4 Remote-gateway path entry required for MPLS operation is included in the path entry count.*

In the case of IPv4 multicast use

With regard to the number of route entries for IP unicast, number of route entries for

BCU memory size	IP unicast				IP muiticast					N ATM pe
	Maximum path entry count				PIM			DVMRP		
	--	Maximum number of entries by protocols				(S,G) entry count	Interface count	(S,G) entry count	Interface count	
		RIP +OSPF	BGP	Static						
128MB or more	10,000	10,000	-	500		Unused	Unused	Unused	Unused	25 l
		5,000	5,000							
	10,000	10,000	-		DM	10,000 or less	32 or less	-	-	
						5,000 or less	64 or less	-	-	
						2,500 or less	128 or less	-	-	
	10,000	10,000	-		SM	1,000 or less	31 or less	-	-	
	10,000	10,000	-		-		-	10,000 or less	32 or less	
256MB or more	250,000	10,000	250,000	1,000	Unused		Unused	Unused	Unused	2 or
	90,000	10,000	90,000		DM	10,000 or less	32 or less	-	-	

BCU memory size	Maximum path entry count				PIM			DVMRP		No. of ATM VCs per NIF
	--	Maximum number of entries by protocols				(S,G) entry count	Interface count	(S,G) entry count	Interface count	
		RIP +OSPF	BGP	Static						
1,024MB or more (Note 8)	500,000	30,000	500,000		DM	5,000 or less	64 or less	-	-	
	1,000,000 (Note 9)	30,000	1,000,000		Unused		Unused	Unused	Unused	
	1,500,000 (Note 10)	30,000	1,500,000		Unused		Unused	Unused	Unused	
	2,000,000 (Note 10)	30,000	2,000,000		Unused		Unused	Unused	Unused	
Remark		(Note 1 (Note 2) (Note 3) (Note 5) (Note 6)			(Note 1) (Note 3) (Note 6) (Note 7)					(Note 1) (Note 4)

(Note 1) If the basic control unit is duplicated, it is necessary to expand the memory so as to achieve the minimum required memory amount for both the operating RM and the standby RM.
(Note 2) The number of route entries includes the number of static routes, direct routes, summarized routes and default routes. The maximum number of active entries is 250,000.
(Note 3) The number of route entries and (S,G)entry count includes that of the alternate route.
(Note 4) For the accommodating conditions regarding the number of VCs, refer to Table 3-29: The number of VCs in

Routing processor module (RP) memory	IP unicast path entry count	IP multicast path entry count					ARP static entry count	ATM VC count per NIF	Min. guara
		PIM			DVMRP				
		(S,G) entry count		Interface count	(S,G) entry count	Interface count			
64MB or more	10,000 or less	1,000 or less		64 or less	-	-	4096 or less	256 or less	kb N
		-		-	1,000 or less	32 or less			
96MB or more	250,000 or less	DM	10,000 or less	32 or less	-	-		2,048 or less	
			5,000 or less	64 or less	-	-			
			2,500 or less	128 or less	-	-			
			1,250 or less	256 or less	-	-			
		SM	1,000 or less	31 or less					
			-	-	10,000 or less	32 or less			

MPLS protocol mode	Function item	Detailed item	Support
Common to both modes.	Number of VPNs accommodated per edge router	When any of BCU-H850/ BCU-M850H/BCU-L850 are used and software after Ver. 06-03 is used.	2,559 as maximum
		When BCUs other than those stated in Item 1 are used or software before Ver. 06-02 is used.	255 as maximum
LDP (DU)	MPLS net size	Number of LSRs per MPLS net	2,000 as maximum
	Number of LDP sessions	Number of LDP sessions per device (number of adjacent MPLS router)	Refer to Table 3-39: The relationship among BCU mounted memory amount, number of LDP sessions and number of routes (only for LDP(DU) mode).
	Number of BGP4 routes of non-VPN	Per device.	6,000 as maximum
	Number of VPN routes	Number of VPN routes per device	120,000 as maximum
		Value designation	1 - 10,000,000
		Name (character string) designation	Alphanumerics within 14 letters

mode			
	VPN ID		- Ver. 06-00 : 1-255 Ver. 06-01 - : 1-10,000,000
			Not permitted.

**1:a < 2,000. a + b + c ≥ 4,000*
a: Number of LSPs to be Ingress, b: Number of LSPs to be Core, and c: Number of LSPs to be Egress.
**2: Maximum of 255 before Ver. 05-02*
**3: If ATM is used as a backbone line, the number of LDP sessions is one per VP. Therefore, the number of LDP sessions depends on the maximum VP value.*
**4 If ATM is used as a backbone line, the LSP is allocated to VC. Therefore, the number of LSPs depends on th maximum VC value. The ATM determines whether VCIs of an odd number shall be used or VCIs of an even num shall be used when the LDP session is established. Therefore, if the number of LSPs to be established is not th same in both directions, the number of VCs to be defined will be greater than the number of LSPs to be actually u In addition, if the number of VCs per line exceeds 1024 when the statistic function of the MPLS is used, some of VC statistics may not be acquired. It is recommended to make the number of VCs per line smaller than 1023.*
**5: In a case where the number of LDP sessions is 20 or more, if a condition is made that the MPLS event log information is indicated by the mpls monitor start command, impediment to the RP/line may occur, or if close/free performed, the other LDP session may collapse and the LSP may be disconnected. It is recommended that no condition should be made that the MPLS event log information is indicated by the mpls monitor start command w the number of LDP sessions is greater than 20.*

entry number describable when utilizing the MPLS policy routing function. This function requires that the total number of IP filter entries used by all the functions mounted in this device be set so that this value is not exceeded in order to utilize the IP filter table as in the IP policy routing function.

Table 4-55 Maximum entry number of MPLS policy

Item	Maximum RP entry number	Maximum device entry number
Maximum number of describable policy entry	2,000/RP	10,000/device

4.2.11.7 Dynamic Entry and Static Entry Maximum Entry Count

The maximum entry count of dynamic and static entries when using MPLS functions is shown in Table 4-56. Use a sum total of dynamic and static entries that does not exceed the maximum device entry count. When using maximum entries, it is necessary to have the memory capacity indicated in (d) Minimum Required Memory.

conditions when utilizing the COPS function. With the COPS function, the accommodating conditions for the maximum flow entry number and the maximu QoS queue attribute entry number are applied in order to realize the policy set fro policy server by utilizing the QoS control function of the device.

Table 4-57 COPS agent accommodating conditions

Item	Description
Cabinet	All model
RP	Memory size of 96 MB or greater
RM	Memory size of 256 MB or greater
Maximum number of interfaces that can control COPS agent	256 interfaces/device
Maximum number of flow entries in COPS agent	Refer to "Configuration definition command reference, flow filter (IPv4) and flow qos (IPv4
Maximum number of Qos queue attribute entries in COPS agent	Refer to "Configuration definition command reference, qos-queue-list (QoS queue attribut

Accommodated RP condition	IPv6 providing function				
	IPv6 relaying	Filter	QoS	IP tunneling	IPv6 multicast
RP-A1, RP-CRP-D	S/W processing	S/W processing	None	RM processing	None
RP-C6, RP-D6	H/W processing	H/W processing	H/W processing	RP processing	H/W processing
(Note: 1) If RP-C6 and RP-D6, and RP-ALRP-C and RP-D are mounted in a mixed way, the IPv6 function can only be used in RP-C6 and RP-D6. The IPv6 function cannot be used in RP-ALRP-C and RP-D. *(Note: 2) RP-CV and RP-DV are not supported in ROUTE -OS6.*					

4.2.12.2 IPv6 function restrictions regarding the routing processing mechanism (RP) mounting conditions

- Replacement of RP by inserting and removing a cock

  When replacement of RP is performed by inserting and removing a cock when the IPv6 function is used, the device requires re-actuation if replaced from RP-C6 to RP-ALRP-C.RP-D, or from RP-ALRP-C.RP-D to RP-C6 and RP-D6.

- New expansion of RP

  The device requires re-actuation if RP-C6 and RP-D6 are additionally installed to

IPv4 multicast and the minimum required memory of a basic control module (BC on the number of NDP static entries when an IPv6 function is used are shown in Table 4-61. The minimum required memory of RP is also shown in Table 4-62.

Table 4-61 BCU minimum required memory

BCU memory size (Note 1)	IPv4 unicast					IPv4 multi cast		IPv6 unicast					RA No. of enter face
	No. of route entries				No. of ad-jacent routers	No. of static entries	No. of ad-jacent routers	No. of route entries				No. of ad-jacent routers	
		Break-down by protocol		No. of static entries					Break-down by protocol		No. of static entries		
		RIP+ OSPF	BGP						RIPng	BGP 4+			
128 MB or more	10,000 or less	10,000	---	500 or less	64 or less	0	0	2,000 or less	1,000 or less	---	1,000 or less	64 or less	32 or less
	2,000 or less	2,000	---	500 or less	64 or less	500 or less	32 or less	2,000 or less	1,000 or less	---	1,000 or less	64 or less	32 or less
256MB	90,000 or less	10,000	80,000	1,000 or less	256 or less	5,000 or less	8 or less	25,000 or less	1,000 or less	25,000 or less	1,000 or less	256 or less	32 or less
	(Note 2)(Note 4)(Note 5)(Note 6)					*(Note 11)*		*(Note 3)(Note 4)(Note 5)*					

Routing processor module (RP) memory	IPv6 unicast path entry count	IPv6 multicast path entry count	IPv4 unicast path entry count	IPv4 multicast path entry count	No. of ATM VCs per NIF
32MB or more	25,000 or less	1,000 or less	10,000 or less	1,000 or less	256 or less
96MB or more	25,000 or less		90,000 or less	5,000 or less	2,048 or less
Remarks		(Note 1)	(Note 1)		(Note2) (Note3)

(Note 1) Memory must be extended for all RPs implemented in a router.
(Note 2) Memory must be extended so that only the corresponding RP can obtain the minimum required memory. (The memory required differs for each RP.)
(Note 3) For the accommodation conditions on the number of VCs, see Table 4-63.

4.2.12.4 Number of NDP Entries

In a network of Ethernet and gigabit Ethernet, the hardware address corresponding to the destination address of a packet to be transmitted is determined by address solution in NDP. Therefore, the maximum number of destination routers is determined by the number of NDP entries. The number of NDP entries is shown in Table 4-63.

interfaces. The maximum number of interfaces in each model whose IPv6 addres can be set is shown in Table 4-64. The value shown in the table is the value obtained when the number of tunnel interfaces is subtracted. Moreover, the operation in the maximum number of interfaces presupposes that router informat is set using a static route. The maximum number of effective interfaces is limited the performance of route information calculation when dynamic routing such as RIPng and BGP4+ is used.

Table 4-64 Number of interfaces

Router Model	IPv6 relaying	Number of interfaces	
		Per RP	Per Router
GR2000-2S	S/W processing	32	32
GR2000-4S	S/W processing	32	32
GR2000-6H			
GR2000-10H			
GR2000-20H			
GR2000-4	H/W processing	256	256
GR2000-6H			
GR2000-10H			

over IPv4 tunnel is shown in Table 4-66. The total number of both tunnel interfaces must be lower than the value shown in Table 4-66

Table 4-66 Number of Tunnel Interfaces

Router Model	Number of interfaces		
	IPv4 over IPv6	IPv6 over IPv4	Per Router
GR2000-2S	256	256	256
GR2000-4S		1024	1024
GR2000-6H			
GR2000-10H			
GR2000-20H			
(Note) For previous versions, the number of settings is 256 in all cases. When setting 1024 interfaces, use of RP-C6/RP-D6 is a prerequisite.			

4.2.12.8 Maximum Number of IPv6 Addresses to be Set

The maximum number of IPv6 addresses that can be set using configuration

Number of addresses set by configuration definition information				Total number of IPv6 addresses set by configuration definition information	Number of I addresses se router
IPv6 settable interface not including tunnel interface		Tunnel interface			
IPv6 link local address	IPv6 gloval address	IPv6 link local address	IPv6 global address		
256	0	0	0	256	256
0	128	0	0	128	384 (Note
256	0	256	0	512	512
0	1792	0	256	2048	2560 (Note
(Note1) (Note3)	(Note1) (Note4)	(Note2) (Note3)	(Note2) (Note4)	(Note5)	

(Note 1) The maximum number of interfaces (not including a tunnel interface) in which an IPv6 address can be s 32 per router irrespective of the model type.
(Note 2) The maximum number of tunnel interfaces is 256 per router irrespective of the model type.
(Note 3) Only one IPv6 link local address can be set to each interface.
(Note 4) A maximum of seven IPv6 addresses can be set to each interface.
(Note 5) The maximum number of IPv6 addresses that can be set using configuration definition information is 32
(Note 6) One IPv6 link local address is automatically set to each interface when only an IPv6 global address is se an interface.

number of adjacent routers (RIPng), and the maximum number of adjacent peers (BGP4+) is shown in Table 4-70. The maximum number of adjacent routers is the number of routers that advertise a route from this router. The maximum number of adjacent peers is the number of peers that advertise a route from this router. The maximum number of entries contains an alternate route.

Table 4-70 Relation Between Number of Route Entries and Maximum Number of Adjacent Peers

Routing Protocol	No. of Higher Peers	Max. No. of Route Entries**	Max. No. of Neighbor Peers***
RIPng	--	1,000	100
BGP4+	1	25,000	15
	2	25,000	10
	3	25,000	5

(Note 1) The maximum number of route entries contains an alternate route.
(Note 2) The maximum number of adjacent peers indicates the number of peers that advertise the route received from the upper peer.
(Note 3) This is the value obtained when an IPv4 unicast and IPv4 multicast are not used.

Item	Max. device entry count	Max. dynamic entry count	Max. static entry cou
IPv6 unicast path entries	25,000/device	25,000/device	1,000/device
NDP entries	1,024/device	1,024/device	1,024/device
IPv4 unicast path entries	250,000/device	250,000/device	1,000/device
ARP	4,096/RP *1	4,096/RP *1	4,096/RP
IPX routing table	1,000/deivce	1,000/deivce	200/deivce
IPXARP entry	256/device	---	256/device
Bridge filtering database	2,000/device	2,000/device	500/device

(Note 1) The number of entries per router varies depending on each model. It corresponds to the multiplier of th number of RPs that can be implemented.

4.2.13 Tag-VLAN

The accommodation conditions in which Tag-VLAN is used are described below.

4.2.13.1 Routing Processor Module (RP) and NIF

Router Model		Number of Tag-VLAN	
		Per RP	Per Router
GR2000-2S		Tag-VLAN cannot be set.	
GR2000-4S		256	256
GR2000-6H	BCU-H300H	256	256
	BCU-H850H		256 x RP
GR2000-10H	BCU-M300H		256
	BCU-M850H		256 x RP
GR2000-20H	BCU-L300H		256
	BCU-L850H		256 x RP

4.2.13.3 Number of Tag-VLANs to be Set in Multi-Home

Like an IP address, Tag-VLAN can be set to the multi-home connection of LAN. Therefore, the maximum number of Tag-VLANs to be set decreases when an IP address is assigned to an interface for the purpose except Tag-VLAN. The maximum number of Tag-VLANs to be set at that time is shown in Table 4-75.

conditions when utilizing the COPS function. In the COPS function, the accommodating conditions for the maximum flow entry number and the maximu QoS queue attribute entry are applied in order to realize the policy set from the po server by utilizing the QoS control function of the device.

Table 4-76 COPS agent accommodating conditions

Item	Description
Cabinet	All model
RP	Memory size of 96 MB or greater
RM	Memory size of 256 MB or greater
Maximum number of interfaces that can control COPS agent	256 interfaces/device
Maximum number of flow entries in COPS agent	Refer to "Configuration definition command reference, flow filter (IPv4) and flow qos (IPv4
Maximum number of Qos queue attribute entries in COPS agent	Refer to "Configuration definition command reference, qos-queue-list (QoS queue attribut

4.3.1 Items to be Prepared

- Operation terminal
  Prepare an operation terminal in advance since one is required for the device to execute configuration definitions and operation commands. A CD-ROM drive is required by the terminal for loading the software.
- Backup use MC
  The control program of the device, configuration definition data and so forth are stored in the MC. It is not possible to activate the device if the MC malfunctions. In order to execute prompt recovery (replacement of the malfunctioning MC) in the event of an MC malfunction, it is necessary to copy the data in the MC using a backup MC. If you do not purchase two MCs when placing your order, it is recommended that you separately purchase an additional MC for backup use. Do not connect the RM Ethernet port to the same segment of the RP's Ethernet port. Use these ports independently of each other.

4.3.2 Network Configuration

- Prohibited topology

When you connect GR2000 and any other router on Ethernet, pay attention to th restrictions shown below.

4.4.1 10BASE-T/100BASE-TX

Match the interface type (10BASE-T or 100BASE-TX) and the full-duplex/ half-duplex mode setting between GR2000's configuration definition and the oth router's interface status. Otherwise, connection will fail.

4.4.2 100BASE-FX

GR2000 can be defined to operate either in full-duplex fixed mode or in half-dup fixed mode on 100BASE-FX. Set up the configuration information in accordance w the line speed of the neighbor connection device (e.g., media converter).

4.4.3 1000BASE-SX/1000BASE-LX/1000BASE-LH

GR2000 can operate only in full-duplex fixed mode on 1000BASE-SX,

This router supports IEEE802.1Q (Tag-VLAN), but it does not support IEEE802.1p (priority control).

4.5 WAN Networking Restrictions

4.5.1 Required Settings on GR2000 for Connecting Other Devices on PPP

Connecting GR2000 to certain devices on PPP sometimes require specific setting of configuration definition options on GR2000 as shown in Table 4-77. For the configuration definition operation, see Subsection 3.7.1 in *Configuration Guide*.

Table 4-77 PPP Configuration Definition Settings Required with Specific Devices

Target Device	Required Setting on GR2000	Required Setting on Target Device
NP220	None (default)	None (default)
NP200	None (default)	NP200 Ver04-02 or below: Set LQR Nego parameter (quality monitor protocol or PPP property) to No.

utilizes InverseARP protocol in compliance with RFC1293/RFC2390. Since InverseARP is not a mandatory requirement, certain products may not support it Consequently, there may be cases when the frping command issued from GR2000 ends in a timeout even the target device is in the reachable status.

4.5.2.4 Conditions When Submitting Application Form to Frame Relay Network

This information is for Japan only. If you need this information, contact our sale representative.

4.5.2.5 Packet Length

If the MTU setting of GR2000 and that of the other end device is different, packet be relayed may sometimes be discarded. Specifically, such discarding of packets occurs on the receiving device whose MTU setting is smaller than that of the transmitting device. Make the MTU setting identical. For example, when you conn GR2000 with Cisco Systems' routers, set the MTU of GR2000 to 1502, using the -max_packet_size option of the dlci command. The MTU length used in IP fragment is -max_packet_size -2 of a dlci command. For the IP fragment, see the "Application Guide".

Filling columns in application form		Designation of application when this device is connected	Setting the configuration defining information of this device	Remarks
Connecting condition	**General selection alternative**			
Protocol operation of PVC state verification procedure (LMI).	Terminal (DTE)	Select optionally from the three kinds given on the left.	No setting is required because of default operation. When setting explicitly, designate dte by using the poll_direction option of the frame-relay command.	Used most generally.
	Net (DCE)		Designate dce by using the poll_direction option of the frame-relay command.	Not used generally for subscription to the public frame relay net.
	Di-directional		Designate "both" by using poll_direction option of frame-relay command.	is stopped because of the maintenance work. This allows the router of the connected counterpart to take appropriate actions including route change.

Filling columns in application form		Designation of application when this device is connected	Setting the configuration defining information of this device	Remarks
Connecting condition	**General selection alternative**			
CLLM message	Supported.	Select any one item from the description on the left.	Designate the signal reception monitoring time by using cllm_sustain option of frame-relay command. The designated value shall agree with the time interval that the net transmits CLLM periodically.	The CLLM is no in the protocol regulation on th indication code congestion leve hence attention required in usin This device use indication code corresponding t super relay FR NTT.
	Not supported.		No setting is required because of default operation. When setting explicitly, designate no by using the cllm_sustain option of the frame-relay command.	---

4.5.3.1 Required Setting on GR2000 for POS in Multivendor Environment

When you connect GR2000 with other vendor's router on POS interface, set up the configuration definition on GR2000 according to Table 4-79.

Table 4-79 Configuration Definition on GR2000 for POS in Multivendor Environment

Definition Item (Parameter)	Selectable Options (Default Underlined)	Required Setting
Sync clock (-clock)	independent | external	To connect to the network requiring synchronization, alter the setting from independent to external. Avoid clock closed loops. Refer to (2) below.
CRC (-crc)	16 | 32	Make the setting identical between GR2000 and the other device. The default of GR2000 (16) is preferred; if the other device does not support it, alter the setting on GR2000 to 32.
scramble (-scramble_off | -scramble)	-scramble_off | -scramble	Make the setting identical between GR2000 and the other device. The default of GR2000 (-scramble_off) is preferred; if the other device does not support it, alter the setting on GR2000 to -scramble.

Do not set this device and the opposing device simultaneously in network

Restrictions applicable to NWJ1-8U circuit multiplex connections
When mounting NWJ1-8U in the device and setting the PRI circuit, there are limit the number of circuit interfaces and multiplexed time slots. NWJ1-8U restriction are given in Table 4-80

Table 4-80 NWJ1-8U connection restrictions

Line number	Interface	Time slots start number	Posible Time slots	The number time slots
0	High speed digital (1.5M) (leased line)/ High speed digital (1.5M) (ISDN)	TS1 to TS24	1 to 24	1 to 24
1	High speed digital (1.5M) (leased line)/ High speed digital (1.5M) (ISDN)	TS1 to TS24	1 to 24	1 to 24
2	High speed digital (1.5M) (leased line)/ High speed digital (1.5M) (ISDN)	TS1 to TS24	1 to 24	1 to 24
3	High speed digital (1.5M) (leased line)/ High speed digital (1.5M) (ISDN)	TS1 to TS24	1 to 24	1 to 24
4	High speed digital (1.5M) (leased line)	TS1 to TS24	1 to 24	(It is possible define the tim
5	High speed digital (1.5M) (leased line)	TS1 to TS24	1 to 24	

4.6.1 Bandwidth Planning Considerations

4.6.1.1 Routing Capacity of GR2000 on ATM Interface

The routing capacity of GR2000 on ATM interface is 50 kpps transmission per line. Plan the network so that the traffic exceeding the router's capacity will not rush into the router.

4.6.1.2 Cellularization Overhead

When relaying packets from a network of different medium such as Ethernet to an ATM network, the output traffic becomes higher than the input traffic because of the cellularization overhead. Figure 4-9 illustrates a sample cellularization process that converts an Ethernet frame (IP packet) to ATM cells.

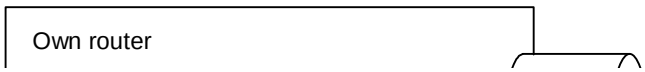
For example, if a 64-byte frame is received from an Ethernet network, the IP packet length is 46 bytes. When transmitting this frame to an ATM network, PAD is added to normalize the data length on 48-byte boundary as shown below.

Header (8 bytes) + IP packet (46 bytes) + PAD and Trailer (42 bytes) = 96 bytes

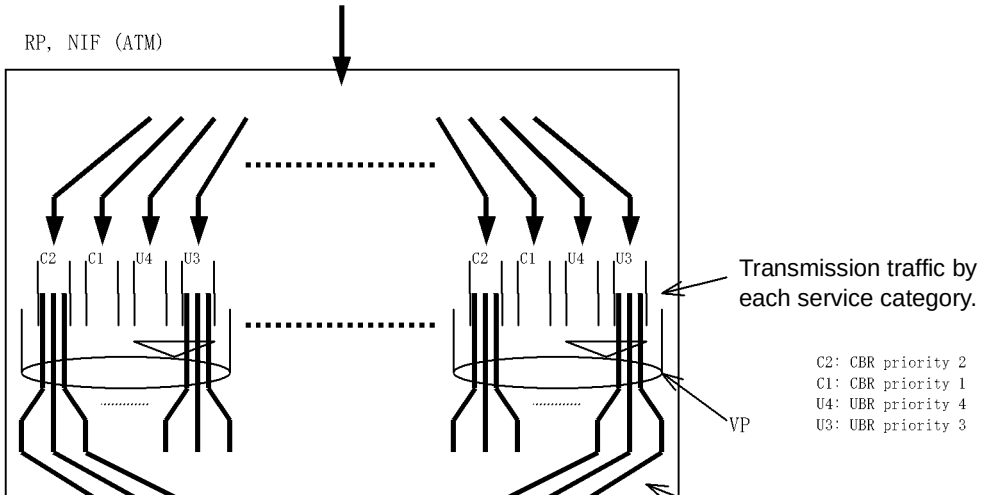
the defined VC bandwidth is exceeded, GR2000 discards the excessive amount o cells as illustrated in Figure 4-10. At this process called shaping, possible loss of l with the other device may result if a dynamic routing protocol such as RIP or OS has been used on the subject interface. The reason is because the shaping proce discards packets regardless of the packet type, thus possibly discarding the cont packet of the routing protocol. Shown below is an example of RIP being used as t routing protocol.

- When 3 minutes or more have passed since the last transmission of the RIP control packet to the other device, the route information taking route on the subject interface is deleted from the routing table of that device, causing link disconnection with that device.
- Reconstruction of the routing table and recovery of the link will take a maxim of 30 seconds since the shaping process on the own router terminates.

In order to avoid the above-mentioned problem, it is recommended to plan the VC bandwidth to withstand a possible rise in traffic.



the outbound control in units of the ATM service categories (CBR, UBR, etc). Pay attention that the Layer 3 QoS available for the LAN or WAN interface such as protocol-based QoS and IP-address-based QoS does not function on the ATM interface.



Connecting GR2000 to certain devices on the ATM interface sometimes require specific setting of configuration definition options on the own router and the othe devices. For the configuration definition operation on GR2000, see Subsection 3. in *Configuration Guide*.

4.6.2.1 ATM Connection with Hitachi NP200 and NP220

Table 4-81 shows the required settings for the ATM connection with Hitachi NP2 and NP220.

Table 4-81 ATM Configuration Definition Settings Required with NP200 and NP220

Connection Type	Required Setting on GR2000			Required Setting on Target Device		
	Com-mand	Parameter	Option	Category	Parameter	Option
OC-3c/STM-1 carrier/ISP	line	-clock	external (default)	ATM line	Clock Source	External
		-frame_format	sdh_idle (default)	ATM line	Frame Format	ITU-T

Table 4-82 ATM Configuration Definition Settings Required with AN1000

Connection Type	Required Setting on GR2000			Required Setting on Target Device		
	Com-mand	Parameter	Option	Categor y	Parameter	Option
OC-3c/STM-1	line	oc3atm | 25atm	oc3atm	LIF	Line Speed	155 155 Shap
		-clock	independent	Port	Clock Source	Internal (default)
		-frame_format	sdh_unassigned	Port	Frame Format	ATM Forum (SDH) (default)
25Mbps	line	oc3atm | 25atm	25atm	LIF	Line Speed	25
Don’t care	-	-	-	Port	OAM Cell Forwarding	None
	-	-	-	Port	ILMI Execution	Disable (default)
	traffic	cbr | vbr | abr |	cbr	Traffic	Service	CBR

This information is for Japan only. If you need this information, contact our sale representative.

4.6.4 Function-wise Conditions for ATM Connection

4.6.4.1 ATM Connection with IPX Devices

Ensure that the IPX device connected over the ATM network satisfies the followin conditions. Hitachi's multiprotocol routers NP200 and NP220 satisfy these conditions.

- Connection based on PVC is available.
- The encapsulation method for IPX packets uses LLC/SNAP in compliance wit RFC1483.

4.6.4.2 ATM Connection with Bridge Devices

Ensure that the Bridge device (e.g., bridge-router, bridge, or LAN switch) connect over the ATM network satisfies the following conditions. Hitachi's multiprotocol routers NP200 and NP220 satisfy these conditions.

–

When you connect GR2000 with devices other than GR2000 based on the IP routing, pay attention to the following.

4.7.1 Interface Address in Point-to-Point Line Connection

GR2000 regards the route information in the point-to-point line connection (direct connection) as two host routes. This method is also adopted in Hitachi routers NP220, NP200, and NP150. Accordingly, when a network only consists of these routing devices, you can assign interface addresses to the point-to-point line as follows. Be careful not to use this method with any other routing device.

- You can assign the same network IP address or subnetwork IP address to multiple point-to-point lines.
- You can assign two different network IP addresses or subnetwork IP addresses to both ends of a point-to-point line.

Note: Although GR2000 treats the route information of a point-to-point line as two host routes, Cisco Systems' routers treat such information as one network route. This causes a discrepancy in the route information advertised by the routing protocol.

When forwarding RIP packets with this device on point-to-point circuits, destinat addresses are sent by unicast addresses (interface address of the other device). I addition, when receiving RIP packets from point-to-point circuits, they are receiv with a unicast address (one's own interface address or limited broadcast address (address of all 1's) as the destination address.

With Cisco routers, the RIP packet destination address is different because of the broadcast-address" setting. Do not make the "ip-broadcast-address" setting if th device is connected to Cisco routers.

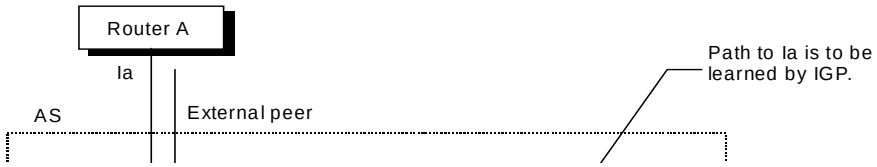
4.7.6 Cautions When Using OSPF on Point-to-Point Circuits

When using OSPF on point-to-point circuits with this device, the HelloInterval default value becomes 10 seconds and the Routerdeadinterval default value becom 40 seconds. With the devices shown in Table 4-84, the HelloInterval default valu becomes 40 seconds and the Routerdeadinterval default value becomes 120 secon on point-to-point circuits. If this device is connected to either of those shown in Table 4-84 by point-to-point circuits, match the HelloInterval value and the Routerdeadinterval value in both routers.

4.7.8.1 Cautions Regarding *NextHop* Resolution

When advertising paths to the BGP speaker in one and the same AS in this device, one's own peering address used for peering with the BGP speaker is set in NEXT_HOP attributes. In addition, path data NEXT_HOP attributes received by the device are resolved based on the IGP path. There is therefore no need to set the other's peering address in NEXT_HOP attributes and Next_Hop is resolved normally as long as the addressing path corresponding to NEXT_HOP attributes is learned by IGP. Designating the "resolve-nexthop all" option of the bgp command makes it possible to extend path data used in Next-Hop resolution to the IGP and BGP paths.

The about Next_Hop resolution processing applies to all peer types (external peers, peers between member ASs, internal peers).



When you replace the existing router (other than GR2000) with this router, pay attention to possible deviation of RIP-1 implementation. For example, the followin routers have different implementations of RIP-1: Hitachi's NP200, NP150, NP100 NP120C, and Cisco Systems' routers.

When an interface address is further divided into subnets, GR2000 does not crea natural mask route (network route for the subject interface). Instead, it creates a subnet route with broadcast connection and a host route with point-to-point connection. Since RIP-1 does not advertise a subnet route that exceeds the addressing boundary, aggregation specifying with the configuration definition is required on GR2000.

A different implementation of RIP-1 may automatically aggregate subnet routes t network route, and an aggregated route is usually not registered in the forwardin table. On GR2000, the aggregated route is by default registered in the forwarding table as the active route.

In order to attain compatible operation on GR2000 with such a device with differ RIP-1 implementation, the noinstall option setting is required for the aggregate definit in the configuration information. Figure 4-12 illustrates a sample network configuration requiring the noinstall option setting.

4.9.1 Connection with IPv6 Router

Pay attention to the following when connecting this router and other equipment by IPv6 routing.

4.9.1.1 Interface Address of Point-to-Point Type Line

This router handles the path information (direct-coupled path) of a point-to-point type line as two host paths. Therefore, in a network consisting of only this router, the interface addresses below can be allocated to the point-to-point type line. Do not use the point-to-point type line between this router and other equipment.

- An IPv6 address with the same prefix can be allocated to multiple point-to-point type lines.
  (For more details, see "Application Guide".)
- An IPv6 address with a different prefix can be allocated to both ends of a point-to-point type line.
  (For more details, see "Application Guide".)

However, the intensive setting of path information is complicated when the addresses

- **Do not advertise the allocated site local address to the outside.**
- **Specify a nexthopself parameter to the configuration definition information of the corresponding peer when sending the received path information to the internal BGP4+ peer using this router.**
- **The setting above is required when making connections with a Cisco router.**

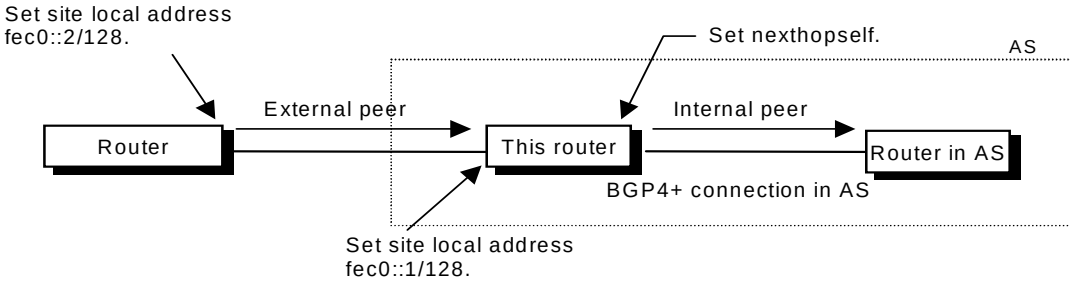


Figure 4-13 Example for Specifying a nexthopself Parameter

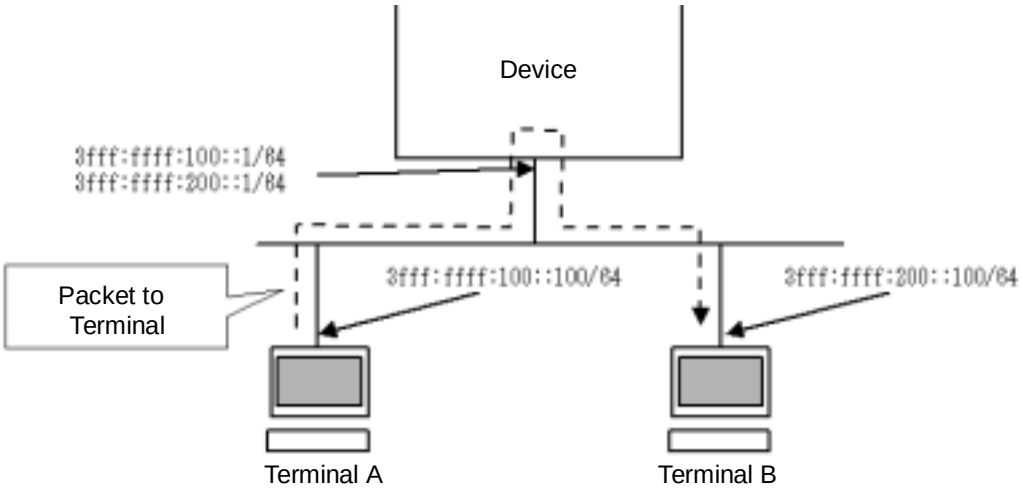


Figure 4-14 Configuration to use the device for communication between IPv6 terminals on the same link

- ICMPv6 re-direct message transmission

the interface is started up. Be careful because, if this action executes the ping6 a traceroute6 commands to the IPv6 address for which duplication has been identi with other devices, a response may be returned from the IPv6 address of another interface in the device, rather than from the IPv6 address designated as the destination.

In addition, because the duplicated address detection is not completed for a few seconds immediately after the interface start-up, a response may similarly be returned from another IPv6 address. However, the operation returns to normal a soon as the duplicated address detection has been completed, hence causing no problem.

4.9.1.6 IPv6 function that can be used at IPv6 relaying software processing

This device performs the IPv6 relaying software processing or the IPv6 relaying hardware processing depending on the type of mounted RP. At the IPv6 relaying software processing, the usable IPv6 function is limited when compared to the IP relaying hardware processing. If all the IPv6 functions in this device are used, it recommended to mount an RP so that the IPv6 relaying software processing is performed. Table 30-31: List of IPv6 function supports by software processing sho

Functional item	Detailed item	
TCP/IP communication function	IPv6 unicast forwarding	
	IPv6 unicast routing	Static
		RIPng
		OSPFv3
		BGP4+
		Export/Import/Aggregate
	Packet filtering function (Note 1)	
Line type	10/100M Ethernet	
	Giga-Bit Ethernet	
	PPP over IPv6	
	ATM over IPv6 (Note 2)	
Tunnel function	IPv6 over IPv4 configured tunnel (Note 3)	
	IPv6 over IPv6 configured tunnel (Note 3)	
etwork management function	SNMP	IPv6 MIB
		ICMPv6 MIB
		TCP MIB for IPv6
		UDP MIB for IPv6

When you use GR2000 as an IPX router, pay attention to the following.

4.10.1 Configuration Settings

4.10.1.1 Setting of RIP Packet Processing

By defining the configuration information, you can make GR2000 as an IPX rout operate in one of the following modes for the RIP data packet processing:

- Dynamic routing only
- Static routing only
- Both dynamic routing and static routing

To choose an option for the above mode setting, you may also need to alter the R control packet transmission interval setting per interface (initially set to 1 minute To operate the router in static-routing-only mode for the RIP data packet processi or to suppress transmission of the RIP control packet on a WAN line because of billing, you must alter these settings.

4.10.1.2 Setting of SAP Packet Processing

- Forward: Does not respond to the watchdog packet on behalf of the client.

Choose an option for the above mode setting, taking the billing for the line such as ISDN and the network traffic into consideration.

Serialization packet and diagnostic packet

GR2000 handles these packets in either “Forward” mode or “Discard” mode available for setting per interface. Since forwarding of these packets is usually unnecessary and increases the billing and the network traffic, the initial mode setting for these packets is “Discard.”

NETBIOS packet

GR2000 always discards the NETBIOS packet at reception (no forwarding action).

4.10.1.4 Use of NetWare 4.1

- When any code other than character is used to represent the server name in the SAP packet, SAP static routing according to that code is disabled.

calculated by the following formula: n ³ 50 (n: number of RIP entries stored).

Example: When n £ 50, 1 packet. When n = 1000 (maximum), 20 packets.

4.10.2.2 Model Traffic of Periodic SAP Packets

The number of periodic SAP packets (480 bytes per packet) broadcast at one time calculated by the following formula: n ³ 7 (n: number of SAP entries stored).

Example: When n £ 7, 1 packet. When n = 1000 (maximum), 143 packets.

4.10.2.3 Traffic of Periodic RIP and Periodic SAP Packets on Group-Defined Interface

When IPX is defined on an interface where multiple VCs or multiple DLCIs are grouped, periodic RIP and periodic SAP packets are broadcast to all the VCs or DL in the group. Consequently, it is cautioned that an inadvertent addition of IPX definition to an existing grouped interface may cause unnecessary traffic to flow through the interface if the group includes a VC or DLCI not using protocols othe than IP. To avoid such occurrence of unnecessary traffic, it is advised to separate group into two—one comprising VCs or DLCIs to use IPX, and the other not usin

When you use the bridge function of GR2000, pay attention to the following.

4.11.1 Protocol and Topology Restrictions

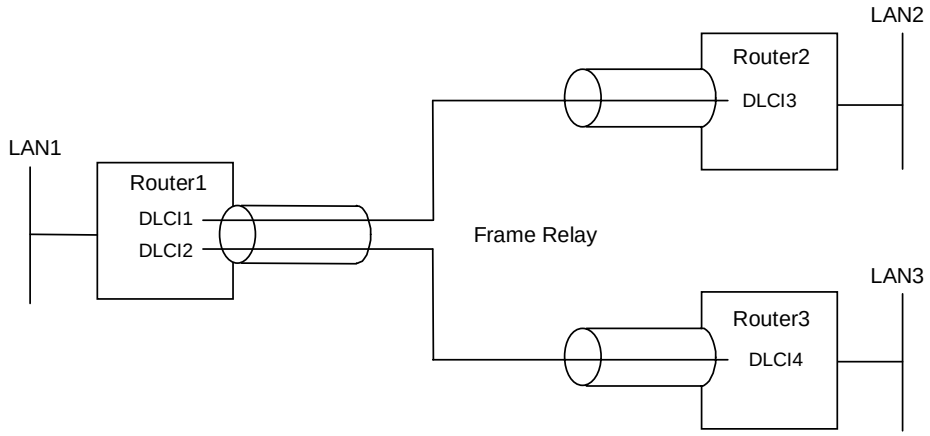
4.11.1.1 Spanning-Tree Protocol

When you use the spanning-tree protocol, ensure that all the bridge-connected routers and bridges are set to use the same level of the spanning-tree protocol (IEEE802.1).

The following timers used for the spanning tree in this router are set so that they operate earlier than the normal bridge router. If operation is carried out in a network in which a bridge router other than this router is combined, adjust the timer values by using the spanning tree configuration definition if any inconvenience occurs because of the relationship with the other router.

Timer type	Default value of this router	Normal default value
Max age time	18	20
Forward delay time	10	15

where frames are bridge-relayed among specified interfaces. In the event that you add the bridge definition to an existing interface with multiple DLCIs in partial-m or full-mesh network configuration, you must redefine a single interface into mult interfaces each with a single DLCI. Conversely, in the event that you plan a new network where the bridge interface definition is anticipated, you are advised to prepare a network where each interface comprises only one DLCI.



When bridge is defined on an interface where multiple VCs are grouped, BPDUs or relay frames not learned are broadcast to all the VCs in the group. Consequently, it is cautioned that an inadvertent addition of bridge definition to an existing grouped interface may cause unnecessary traffic to flow through the interface if the group includes a VC not using protocols other than IP. To avoid such occurrence of unnecessary traffic, it is advised to separate the group into two—one comprising VCs to use the bridge function, and the other not using protocols other than IP—and define these groups to respective interfaces. The same is advised when you further add IPX definition to the existing interface.

4.11.6 Bridge Definition on ISDN Interface

Bridge definition on an ISDN interface is available only on such interface where IP interface is defined to a single ISDN peer. The IP interface should be point-to-point type. Bridge definition on an ISDN interface with ISDN peer group is not available.

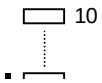
Since the spanning-tree protocol is not available on an ISDN interface, each bridge interface can be defined “yes” or “no.” In addition, when you plan a new ISDN network where the bridge interface definition is anticipated, it is advised that you explicitly avoid a loop configuration in the network.

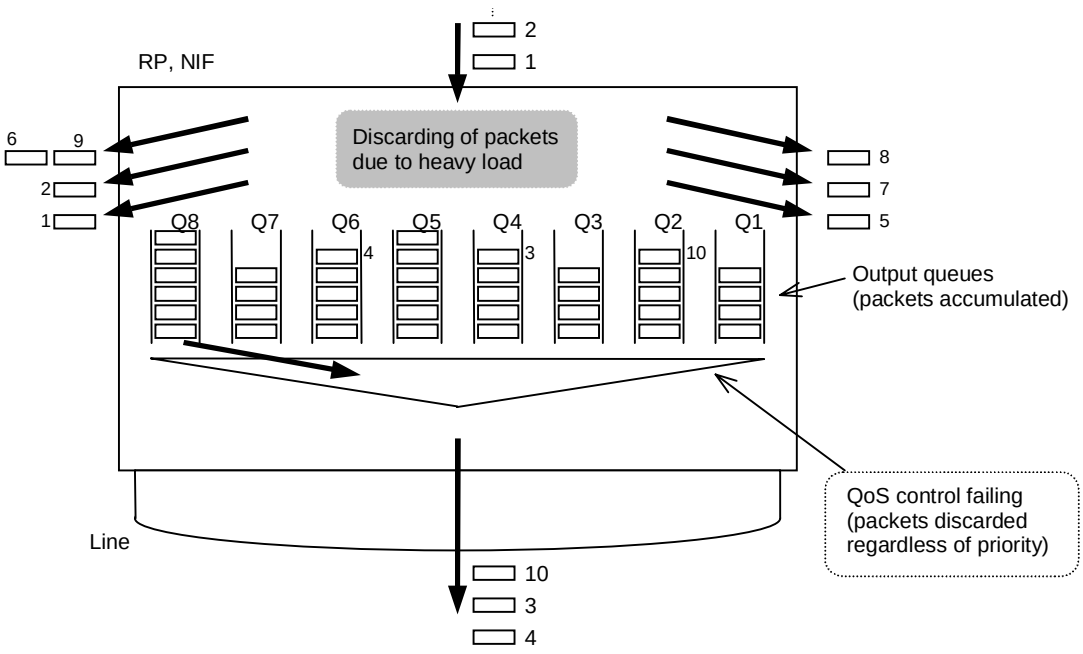
When you use the QoS function of GR2000, pay attention to the following.

4.12.1 Relationship Between Load on RP and QoS

In normal operation, QoS controls queuing and transmitting of packets as illustra in Figure 4-18. In the event of a certain amount of load on the RP, there may be cases when QoS fails and packets are discarded as illustrated in Figure 4-19. Su heavy load on the RP is caused by the following factors:

- Software processing on RP
  - IPX routing is enabled and the traffic is higher than 2500 pps.
  - Bridge is enabled and the traffic is higher than 3500 pps.
  - IP fragmentation occurs often.
  - A lot of packets utilizing IP header option are received and relayed at a tim
- Use beyond configuration limits




RP, NIF
2
1
Discarding of packets
due to heavy load
6
9
2
1
8
7
5
Q8
Q7
Q6
Q5
Q4
Q3
Q2
Q1
4
3
10
Output queues
(packets accumulated)
QoS control failing
(packets discarded
regardless of priority)
Line
10
3
4

4.13.1 Connection with LAN Switch

Pay attention to the following when connecting this router and a LAN switch by Tag-VLAN.

4.13.1.1 VLAN type

The only VLAN that this router supports is Tag-VLAN on an IPv4 packet. VLAN se a LAN switch should be one of the following VLANs, even when the LAN switch th connects this router supports VLAN (e.g., protocol VLAN of IPX) other than the Tag-VLAN.

- Tag-VLAN on IPv4 packets that a LAN switch relays
- Tag-VLAN on the transmission/reception port of a LAN switch

4.13.1.2 Tag-VLAN setting

This router's setting should coincide with Tag-VLAN of the LAN switch connected this router. In this router,

- An interface (specified using a vlan option) that sets VLAN can send and rece

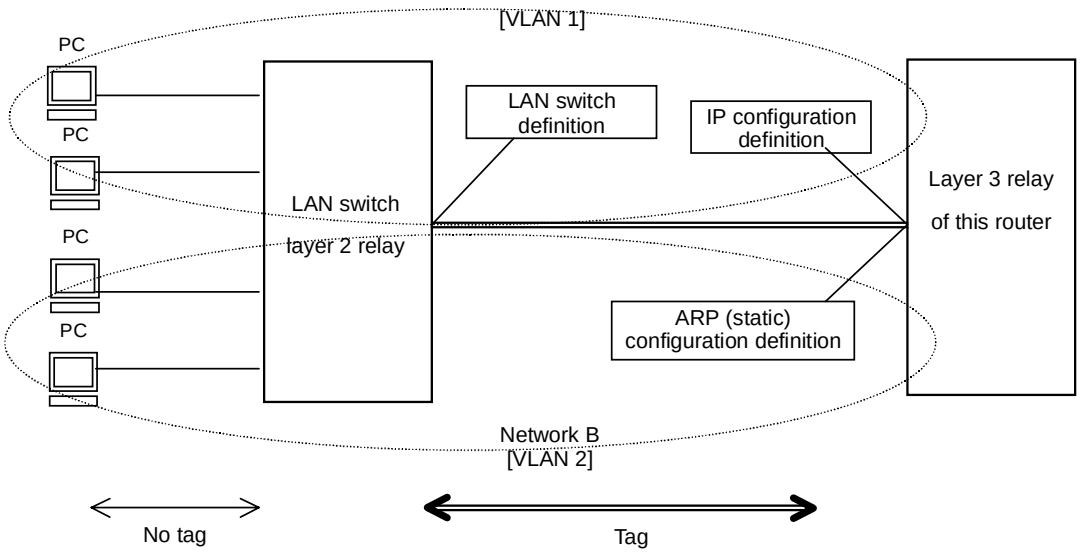


Figure 4-21 Network Configuration

■

4.14.1 Multicast relay

Please pay attention to the following points when relaying a multicast packet usi this router.

4.14.1.1 Common to protocols

This router prepares a multicast routing entry for performing multicast communication when the first multicast packet is received. Because the multica packet is relayed by way of using the software until the entry is prepared, a pack may be lost temporarily.

This router does not support the mixed system of PIM-DM, PIM-SM and DVMRP. Therefore, use the router after unifying the multicast protocols of all the routers (PIM-DM, PIM-SM and DVMRP).

Please take note that multicast communication may stop until the multicast rout information is learned, if the operating system switched to the standby system by means of operation using the duplication router, or if the IP multicast routing program is re-actuated by charging the ip restart multicast command.

- In the system configuration allowing mixed use with a device other than this device, multi-cast communication may become impossible due to difference in the calculation range of check sum for PIM-Register message (capsulated packet). If the Register message does not perform multi-cast relaying at the rendezvous point due to a check sum error, change the range to calculate the PIM check sum by using the configuration defining information of this device. For details, please refer to the "Configuration definition command reference, pim".

4.14.2 Redundant route (route switching due to impediment)

Please pay attention to the following points if the multicast route is a redundant route ins this router.

4.14.2.1 When using PIM-DM

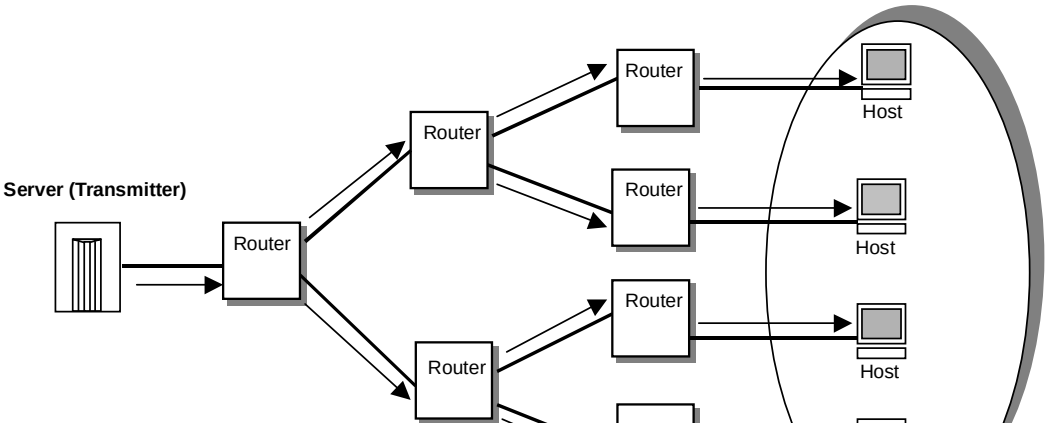
In the case of PIM-DM, the time required to switch the multicast packet communication from a redundant route is a maximum of 210 seconds.

4.14.2.2 When using DVMRP

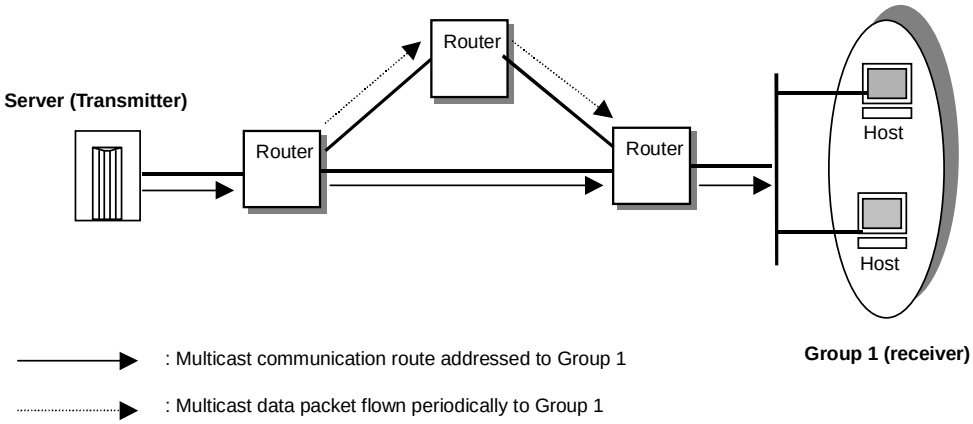
Multicast is suitable for single direction communication of 1 (transmitter): N (receiver) in which data are distributed from a server (transmitter) to each group (receiver). Precautions are given below in relation to the network patterns applica to PIM-DM and PIM-SM:

4.14.3.1 PIM-DM

PIM-DM can be applied to a tree type network.

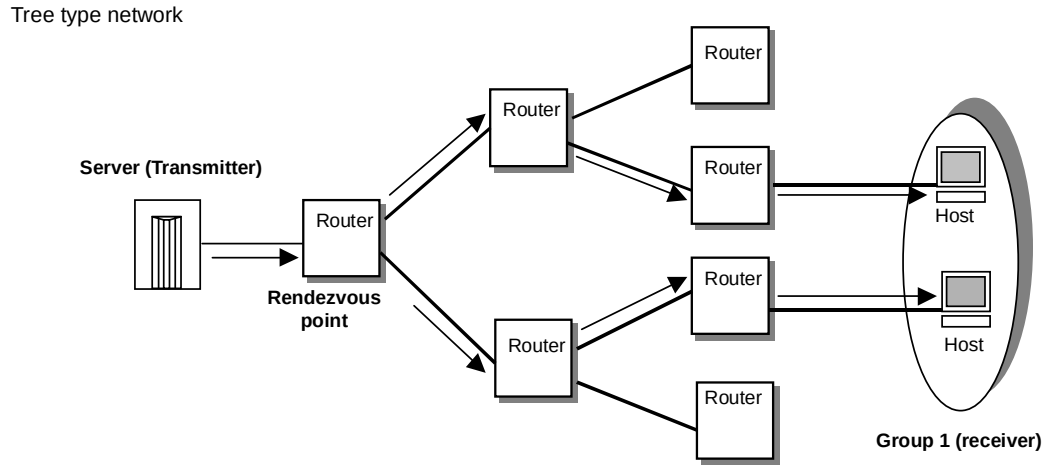


redundant route exists.



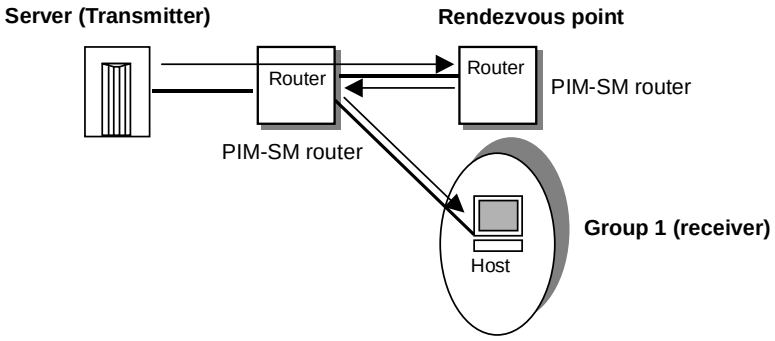
Inapplicable network pattern

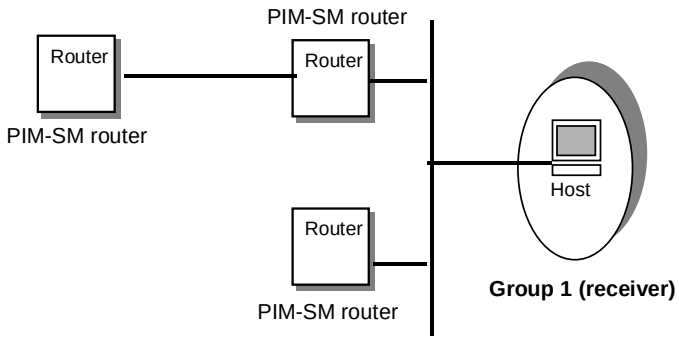
which a redundant route exists. However, please be sufficiently cautious when arranging the rendezvous points. Figure 4-24 shows the applicable PIM-SM network.



- Configuration in which a receiver exists between the transmitter and a rendezvous point

  Relaying via the rendezvous point cannot be performed efficiently if multicast communication is attempted from a server to Group 1 in the following configuration:





4.15 Precautions for using MPLS

4.15.1 Non-permitted mixed use of LSP allocation system for each VPN and RFC2547 bis system

The MPLS/VPN function using the "LDP(DU) mode/RFC2547 bis system" is the

IP-VPN operation syste	VPN ID designating method	Range of values in VPN ID
RFC2547 bis system [Ver. 06-03]	Numerical designatio	1 to 1,000,000
	Name (character string designation)	Alphanumerics within 14 letters with head in alphanumeric, or character string using hyphen and underscore
LSP allocation system for each VPN	Numerical designation (Note 1)	Versions before Ver. 06-01:1 to 255. Versions thereafter including Ver. 06-01: 1 to 1,000,000
	Name (character string designation)	Cannot be designated.
(Note 1) In order to establish the LSP for VPN between a device operating with versions before Ver. 06-01 and a device operating with versions thereafter including Ver. 06-01, it is necessary to use the VPN ID values in the range from 1 to 255 even in a device operating with the versions thereafter including Ver. 06-01. If values outside the range from 1 to 255 are used, the whole MPLS function may become non-utilizable in a device operating with versions before Ver. 06-01.		

4.15.4 Difference in IP-VPN of the LSP allocation system for each VPN using software version

of the LSP can not be transferred, and the restriction on the number of VPNs per MPLS net has been eliminated. Table 4-87 shows the contents of the TLV used.

Table 4-87 Contents of the TLV used

Field	Value
U bit	1
F bit	1
Type	0x3E00
Vender ID	0X87
Date	VPN ID (8 bytes): 1-255 Remote VPN ID (8 bytes): 1-255

The relationship between VPN ID and VPN depends on the software version.

4.15.4.3 Versions prior to Ver. 05-00

The VPN ID is a number of single significance in the MPLS net, wherein an assem

Installation Site Condition

5.1 Environmental Requirements

5.1.1 Temperature and Humidity

To guarantee normal operation of the GR2000 router, observe the temperature a humidity specifications of Table 5-1. In daily usage, also observe the following:

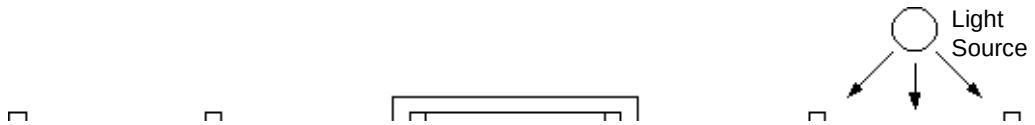
- Do not place the router near a source of heat or a steam.
- Avoid direct sunlight.
- Do not set up the router near a humidifier or water heater.

Dust conditions for this router must meet the criteria of Table 5-2 in falling-dust measurement or floating-dust mass density measurement. A sample process of falling-dust measurement is shown in Figure 5-1.

When the measured value exceeds the acceptable range, and when the conductor and insulator are heavily covered in dust, appropriate protection, such as shortening of the periodic inspection cycle, addition of a dust-proof case, and air purification are required depending on the humidity of the installation site.

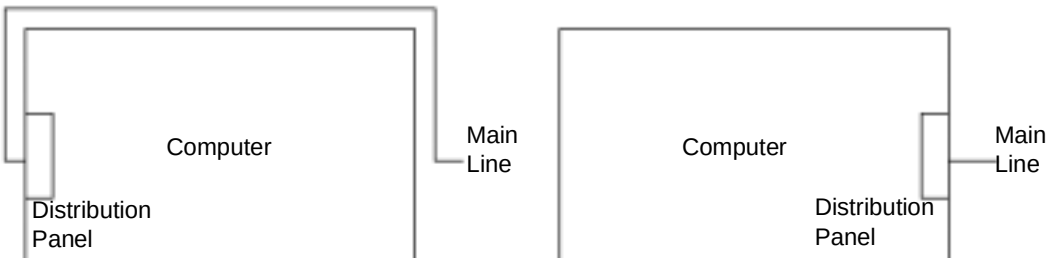
Table 5-2 Dust Requirements

Environmental Item	Falling-Dust Measurement (%/W)	Floating-Dust Mass Density Measurement (mg/m^3)
Dust	5 or below	0.15 or below



To reduce external magnetic field, note the following in facility construction such main power line and air conditioning:

- Do not cross the distribution panel location for the computer system and the primary side main-line cable construction route in the ceiling of the compute room or on the floor. Make the cable route as short as possible when constructing along the wall of the computer room.
- The location of the air conditioning control panel and the cable construction route of the primary side main line should be the same as mentioned above.
- The main-line cable type must be multi-strand. If you use single-strand cable minimize the distance between cables in each phase.



An ordinary office is acceptable for installation of the router; however, if the room where the router is to be installed is to be newly built, flooring with the following qualities is recommended. It is important not to have exposed metal in contact with flooring for safety reasons.

- Insulation resistance: Use materials where the floor surface and ground resistance is 1 x 105–108 W cm. This is recommended for error and electric shock protection against static electricity. This condition is easily satisfied by setting up a conductive circuit.
- Oil resistance: Oil is used for router maintenance.
- Fire resistance
- Dust free

5.1.7 Acoustic Noise

1. Each model of GR2000 contains one or more cooling fans that generate noise. Several measurements at 1 meter from the vertical edge of the device show the following figures:
   - GR2000-2S: approximately 49 dB (A)
   - GR2000-4S: approximately 46dB (A)

- Water:
  - When cleaning the floor, do not wet the router.
  - Do not place vases, etc., on the router.
  - Do not let rain wet the router.
  - In an area where flood damage might occur, determine an evacuation meth for the router.
- Electromagnetic interference: When another high frequency device is used n the router, the router might not operate properly due to interference of electri waves generated by the other device. Also, this router generates a small amou of high frequency electrical waves. It might affect a television, radio, or transceiver with an indoor antenna within 30m.
- Router transport route: The router is transported while packaged, so make s that the transport route has enough room to accommodate the router's net dimensions plus 300 mm for packaging.
- Animals: Ensure that the cables are protected against damage from rodents other animals that could damage them.
- Sprays: When spraying pesticides or disinfectants in the router installed site cover the router to ensure that the chemical does not fall directly on it.
-

5.2.1 Input Power Requirements

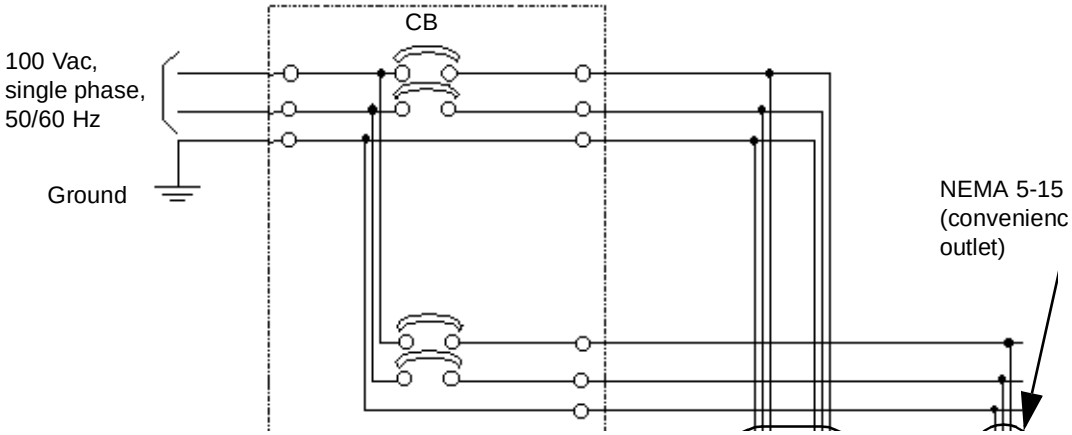
The input power supplied to the GR2000 series models must meet the requirements in Table 5-3 for AC input or those in Table 5-4 for DC input.

Table 5-3 Input Power Requirements—AC Input

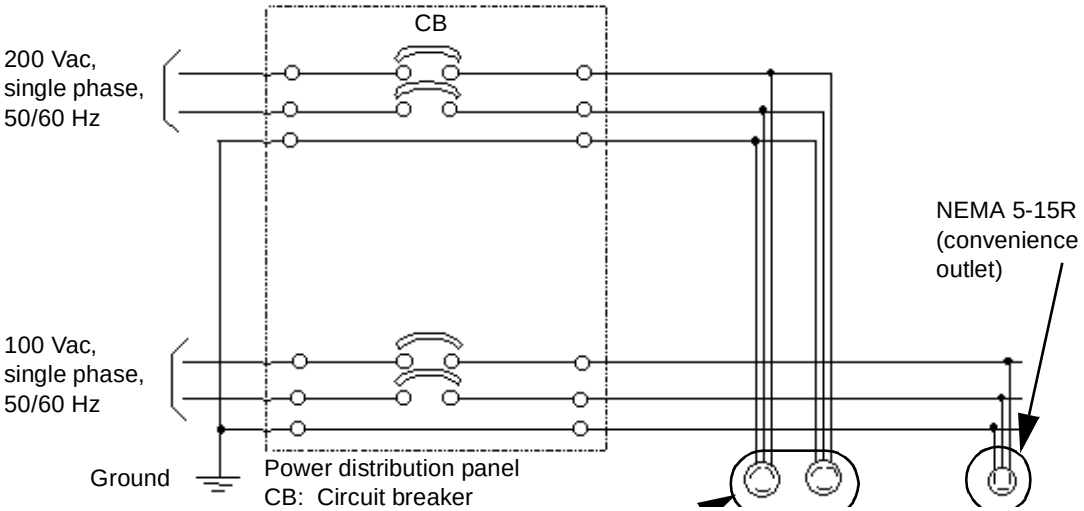
Router Model	Input Voltage	Phase	Frequency (Hz)	Waveform Distortion (%)	Electrical Noise
GR2000-2S	100 Vac ±10 %	Single	50/60 ±1	10 or less	Must not be included.
GR2000-4S	100 Vac ±10 %	Single	50/60 ±1		
GR2000-6H	100 Vac ±10 %	Single	50/60 ±1		
GR2000-10H	100 Vac ±10 %	Single	50/60 ±1		
	200 Vac ±10 %	Single	50/60 ±1		
GR2000-20H	200 Vac ±10 %	Single	50/60 ±1		
GR2000-4	100 Vac ±10 V	Single	50/60 ±1		
	200 Vac ±20 V	Single	50/60 ±1		

5.2.2.1 100V ac Input (GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H, GR2000-4, GR2000-

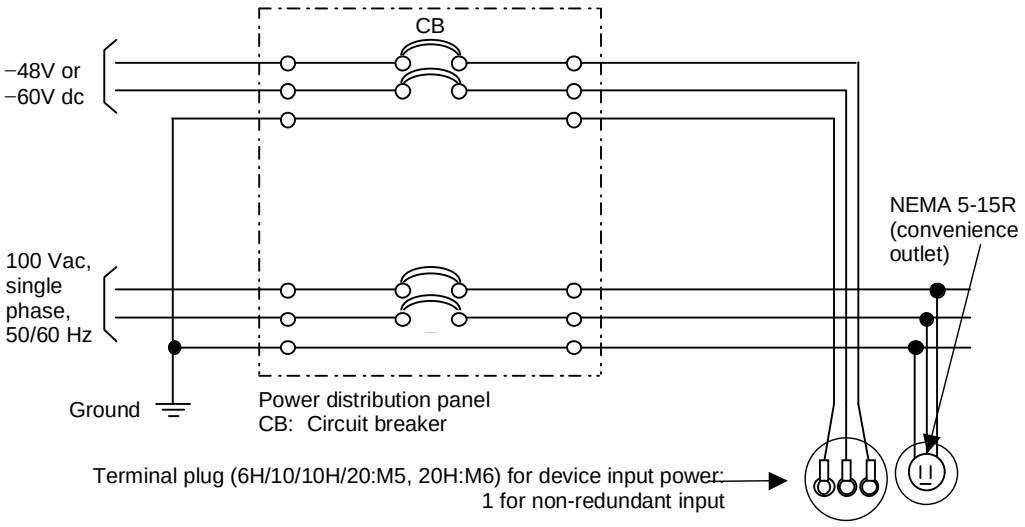
A standard, non-redundant power feeding diagram with 100V ac input is shown Figure 5-3. Figure 5-4 shows its redundant power feeding counterpart, in which c GR2000-2S is not applicable.



A standard, non-redundant power feeding diagram with 200V ac input is shown in Figure 5-5. Figure 5-6 shows its redundant power feeding counterpart, in which case GR2000-2S is not applicable.



shown in Figure 5-7. Figure 5-8 shows its redundant power feeding counterpart.



The branch circuit to be installed on the customer's power distribution panel must be a circuit breaker (CB) in compliance with the requirements in Table 5-5. In addition, follow the guidelines below.

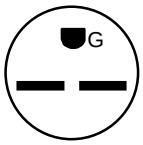
- Do not connect other electrical devices to this branch circuit.
- Total load of the branch circuit must be under 80–90 percent of the rating.
- Prepare a backup circuit to the power distribution panel based on possible device additions in future.
- Locate the device as close as possible to the power distribution panel for ease of maintenance.

Table 5-5 Requirements for Circuit Breaker on Power Distribution Panel

Router Model	AC Input			DC Input		
	CB Type	Phase	Rating	CB Type	Phase	Rating
GR2000-2S	15AT	Single	100 V ac, 15A			
	15AT	Single	200 V ac, 15A			
GR2000-4S	15AT	Single	100V ac, 15A			
	15AT	Single	200V ac, 15A			

Depending on the ac supply voltage and ampacity, the receptacle to mate the inp
power plug must meet the requirements in Table 5-6.

Table 5-6 Receptacle Types for AC Input

Nominal Input Voltage (V ac)	Receptacle				Applicable Router Model	Connect
	Type	Face	Rating	Poles/Wires		
100	NEMA 5-15R		125V 15A	2 poles, 2 wires + ground	GR2000-2S, GR2000-4S, GR2000-6H, GR2000-10H, GR2000-4, and GR2000-10	 Cannot be purchased from Hitach
200	NEMA 6-15R		250V 15A	2 poles, 2 wires + ground	GR2000-2S, GR2000-4S, GR2000-6H, GR2000-4, GR2000-10, and GR2000-20	 Cannot be purchased

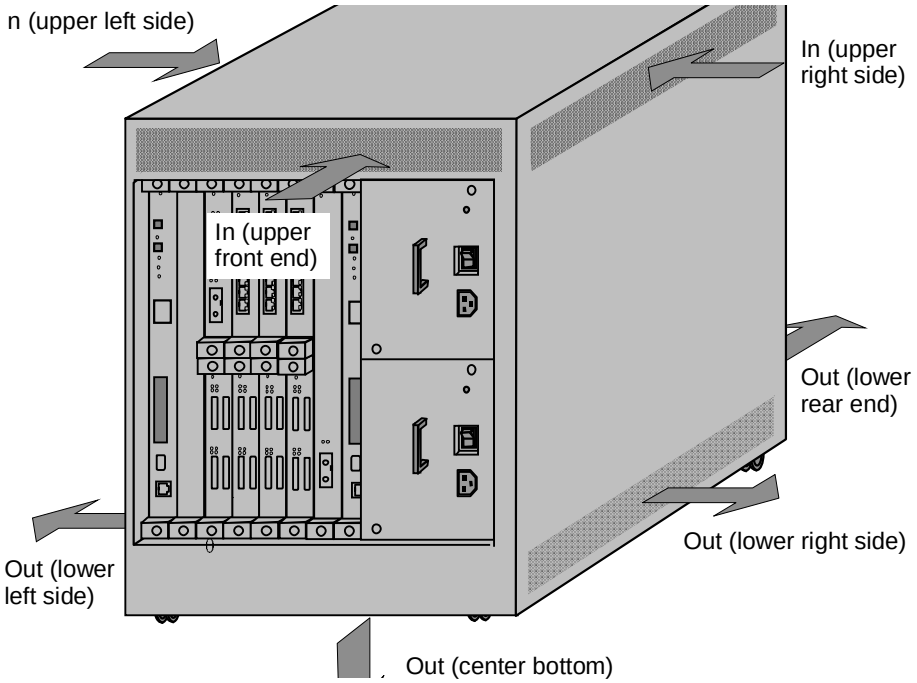
Electrical noise generated by other devices might cause failure. When you plan the power supply, consider the following to enhance anti-noise capability.

- Do not connect a foreign device to the branch circuit for this router, especially a device that switches on/off repeatedly (e.g., an airconditioner) with a relay or microswitch.
- Ground for this device must be connected directly to the grounding panel or be used exclusively for this device.
- Anti-electric-noise circuit must be installed in the device generating the electrical noise.
- Two types of cables, power cables and signal cables, are connected to the router. Since their electric characteristics are different, do not tie or bundle these cables together when routing.
- When a communication line is routed inside the building, do not route it along the power supply section (including the power cable).
- This router includes a noise filter to prevent failure caused by electrical noise. As a result, a ground current of up to 3.5 mA per device goes through the ground. Make sure you are obligated to set up the leakage circuit breaker by local laws or regulations.

Table 5-7 shows typical power consumption and heat dissipation figures. Each configuration assumes the maximum configuration.

Table 5-7 Typical Power Consumption and Heat Dissipation Figures

Configuration	Input Power Condition		Power Consumption (A)	Heat dissipat (W)
	Voltage	Frequency		
GR2000-2S	100 Vac	50/60 ±1 Hz	2	200
GR2000-4S	100 Vac	50/60 ±1 Hz	3	260
	200 Vac	50/60 ±1 Hz	3	260
GR2000-6H	100 Vac	50/60 ±1 Hz	12	1140
	200 Vac	50/60 ±1 Hz	12	1140
	–48 Vdc	–	12	950
GR2000-10H with either redundant or non-redundant POW(s)	100 Vac	50/60 ±1 Hz	12	1080
	200 Vac	50/60 ±1 Hz	8	1350
	–48 Vdc	–	27	1170
GR2000-20H with either redundant	200 Vac	50/60 ±1 Hz	14	2340


n (upper left side)
In (upper
right side)
In (upper
front end)
Out (lower
rear end)
Out (lower right side)
Out (lower
left side)
Out (center bottom)

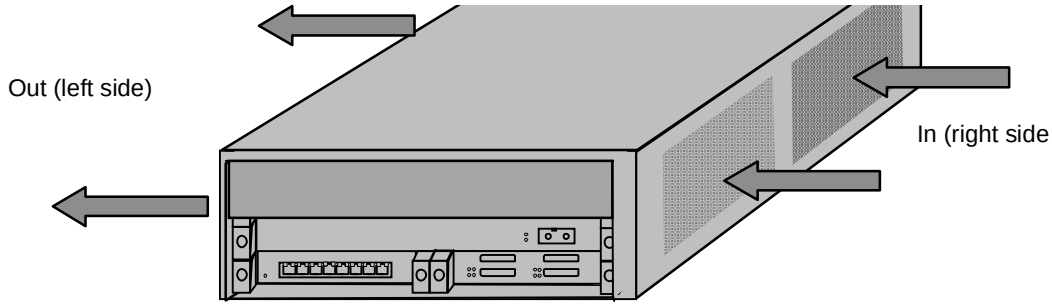
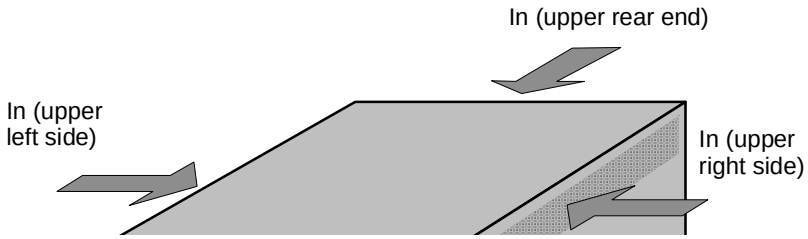
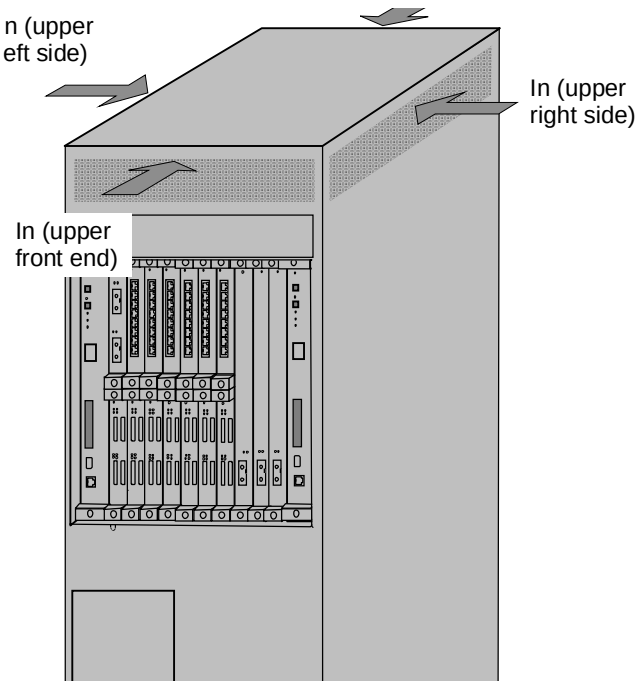


Figure 5-12 Airflow of GR2000-4




n (upper
eft side)
In (upper
right side)
In (upper
front end)

- Heated air from the other device may be taken into this router, causing the intake air temperature to exceed the router's environmental requirements.
- When the air intake or exhaust force of the other device is too strong, a rever pressure on this router's intake air may arise, decreasing the cooling efficienc this router.

Should such adverse effects take place on this router, malfunction or failure may result. Take necessary measures, e.g., place these devices duly apart from each ot or put a partition between them so that their airflows do not interfere with each other.

5.2.7.3 Cooling Requirements for Rack-Mount Installation

To guarantee the airflow through the router for cooling, secure enough space between the router and the structure of the rack as shown below. If not, malfunct or failure may result.

- GR2000-4, GR2000-2S, GR2000-4S and GR2000-6H: 50 mm or greater each from the left side and the right side of the chassis.
- GR2000-10H, GR2000-20H, GR2000-10, and GR2000-20: 50 mm or greater each from the left side and the right side of the chassis, and 300 mm or great

Hardware Installatio

6.1 Unpacking

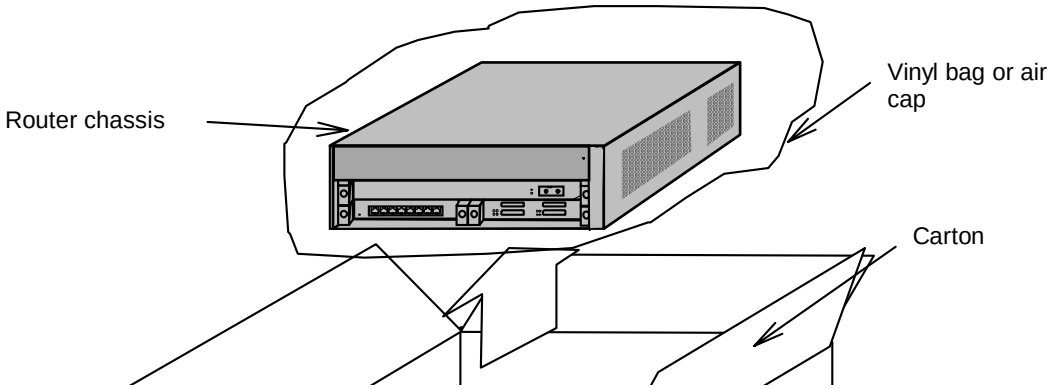
The GR2000 and any accessories will be delivered with a packing list. In each unpacking process, be sure to confirm the contents with the packing list.

6.1.1 Chassis

GR2000-2S

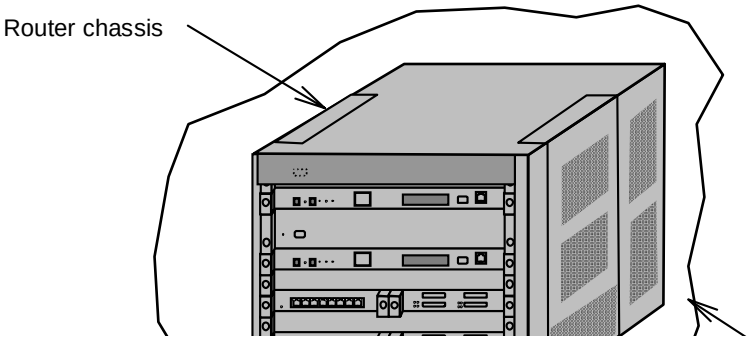
When unpacking this model, see Figure 6-1. Make sure that all the parts in the

Caution: **This model weighs up to 25 kg. Handle with care. Work with another person when you handle this model.**



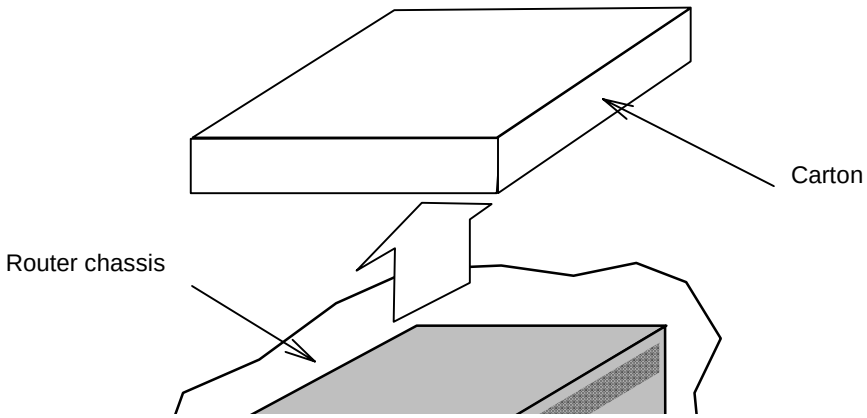
packing list are obtained from the cargo.

Caution: **This model weighs up to 55 kg. Handle with care. Work with another person when you handle this model.**



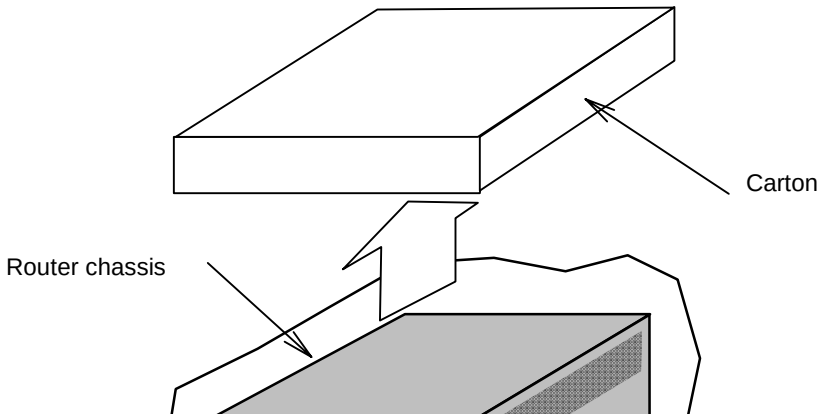
packing list are obtained from the cargo.

Caution: This model weighs up to 120 kg. Handle with care. Work with another person when you handle this model.



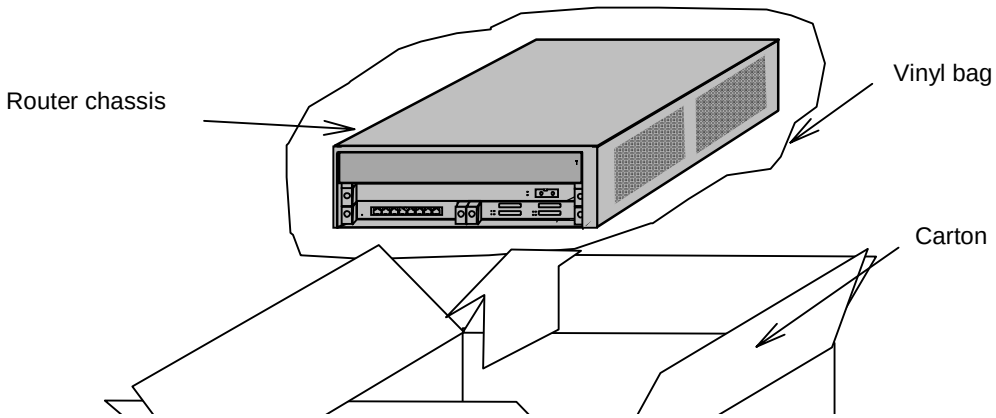
packing list are obtained from the cargo.

Caution: This model weighs up to 160 kg. Handle with care. Work with another person.



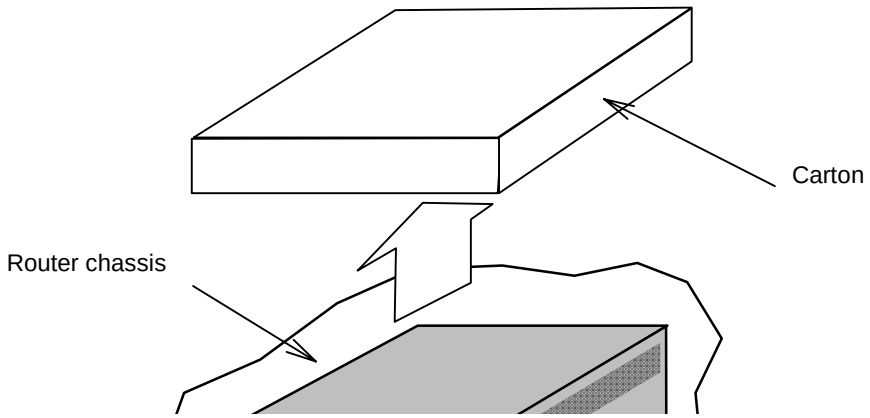
packing list are obtained from the cargo.

Caution: This model weighs up to 25 kg. Handle with care.



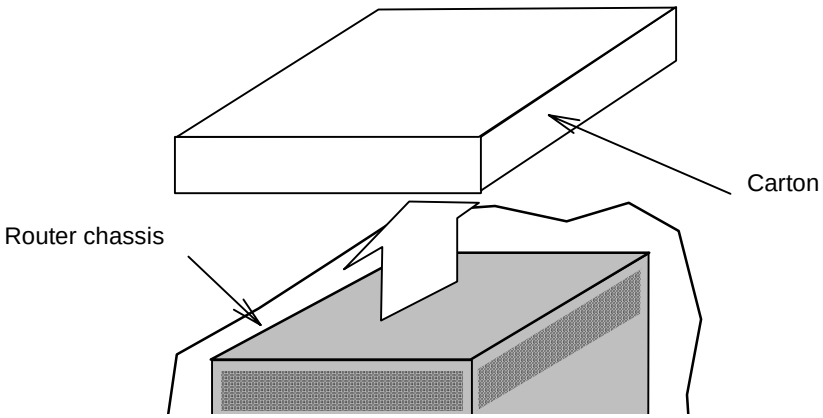
packing list are obtained from the cargo.

Caution: This model weighs up to 85 kg. Handle with care. Work with another person.



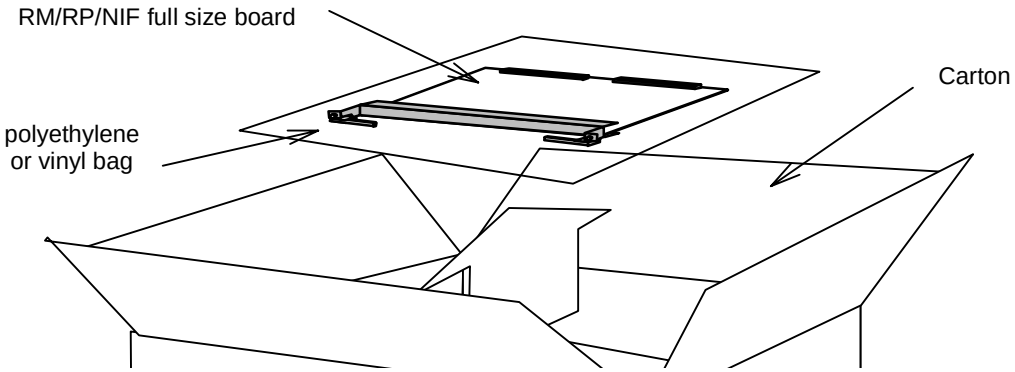
packing list are obtained from the cargo.

Caution: This model weighs up to 190 kg. Handle with care. Work with another person.



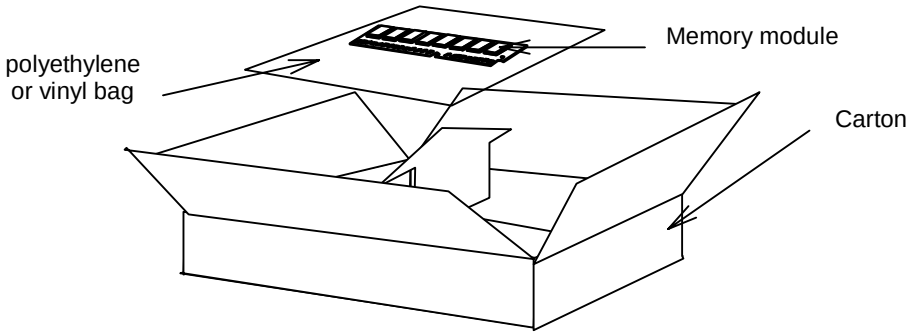
When unpacking a separately shipped RM/RP/NIF module, see Figure 6-9 and Figure 6-10. Make sure that all the parts in the packing list are obtained from th cargo.

Caution: This component is subject to damage from static electricity. Before you are familiar with how to handle it in 6.2, do not unwrap the component.



When unpacking a separately shipped memory module, see Figure 6-11. Make sure that all the parts in the packing list are obtained from the cargo.

Caution: This component is subject to damage from static electricity. Before you are familiar with how to handle it in 6.2, do not unwrap the component.



When unpacking a separately shipped cable, see Figure 6-13. Make sure that all parts in the packing list are obtained from the cargo.

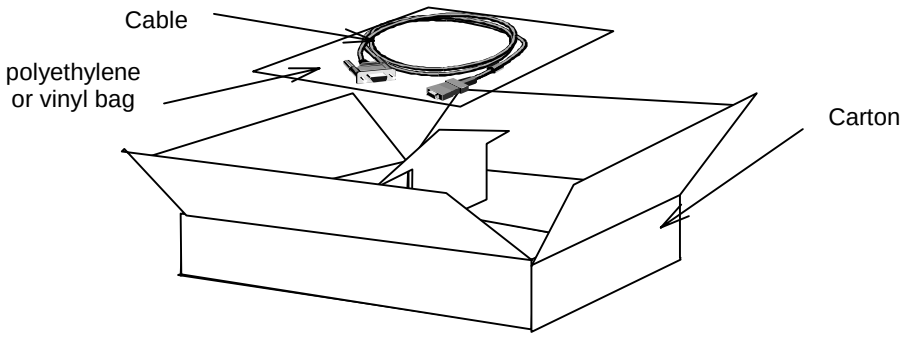


Figure 6-13 Unpacking of Separately Shipped Cable

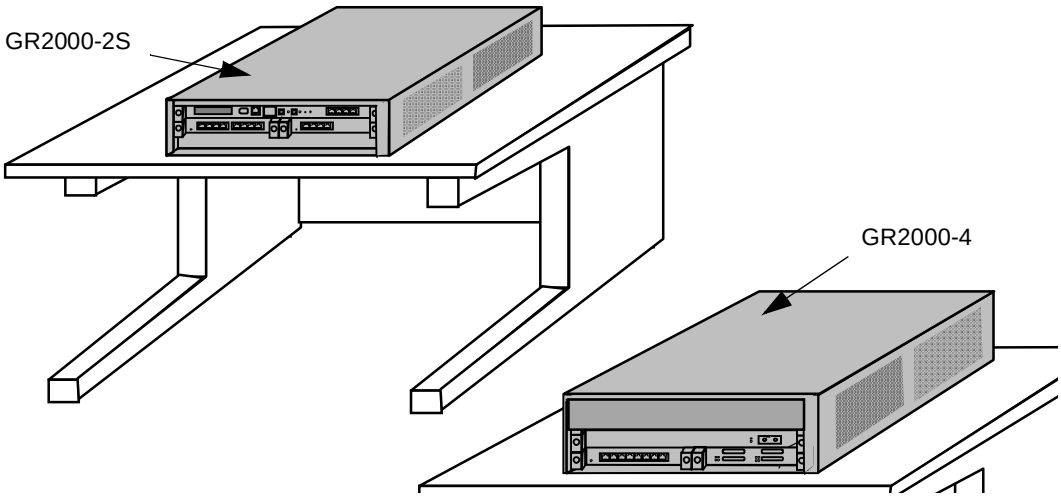
6.2 Handling of Components Subject to Static Electricity

This section describes how to install the chassis of GR2000-2S, GR2000-10H, GR2000-20H, GR2000-4, GR2000-10, and GR2000-20. Before installing a target model, make sure the allowable style of installation according to Table 6-1, where “X” means applicable and “NA” means not applicable. Also determine the desktop/floor/rack-mount installation layout, including minimum service clearance and area for airway, in accordance with 3.1 and Subsection 5.2.7.

Table 6-1 Allowable Style of Installation by Router Model

Router Model	Allowable Style of Installation		
	Desktop	Floor	Rack-Mount
GR2000-2S	X	NA	X
GR2000-4S	X	NA	X
GR2000-6H	X	NA	X
GR2000-10H	NA	X	X
GR2000-20H	NA	X	X
GR2000-4	X	NA	X
GR2000-10	NA	X	X

In this style of installation, place the router chassis to meet the minimum service clearance requirements, the cooling requirements, and the general rules as previously mentioned. Figure 6-15 shows GR2000-2S and GR2000-4 each instal on the desktop.



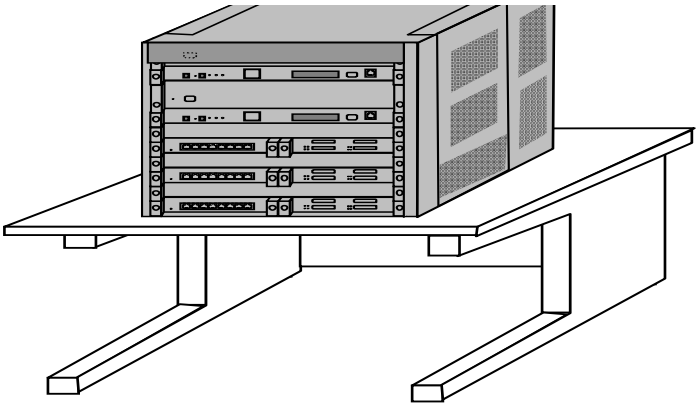
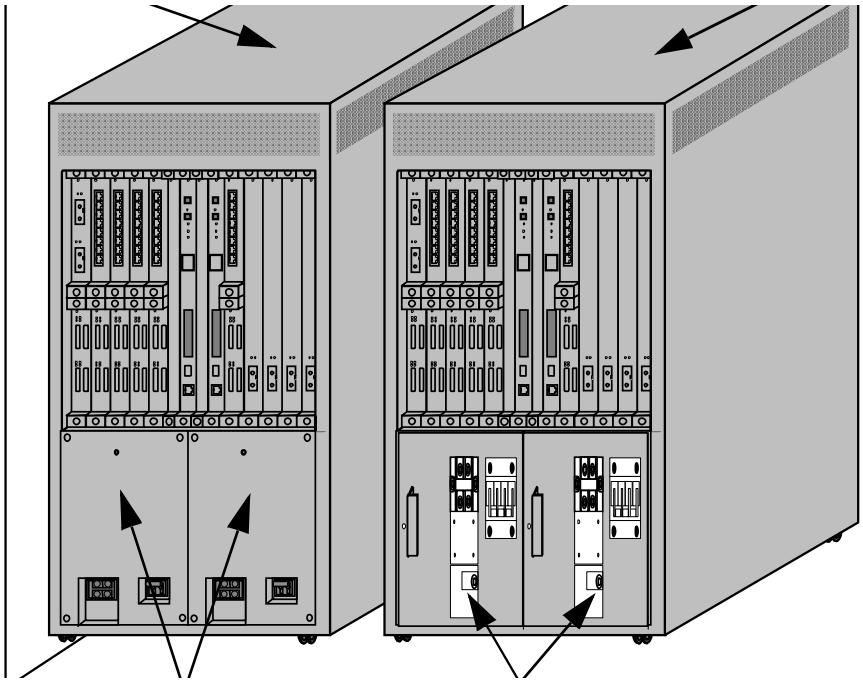
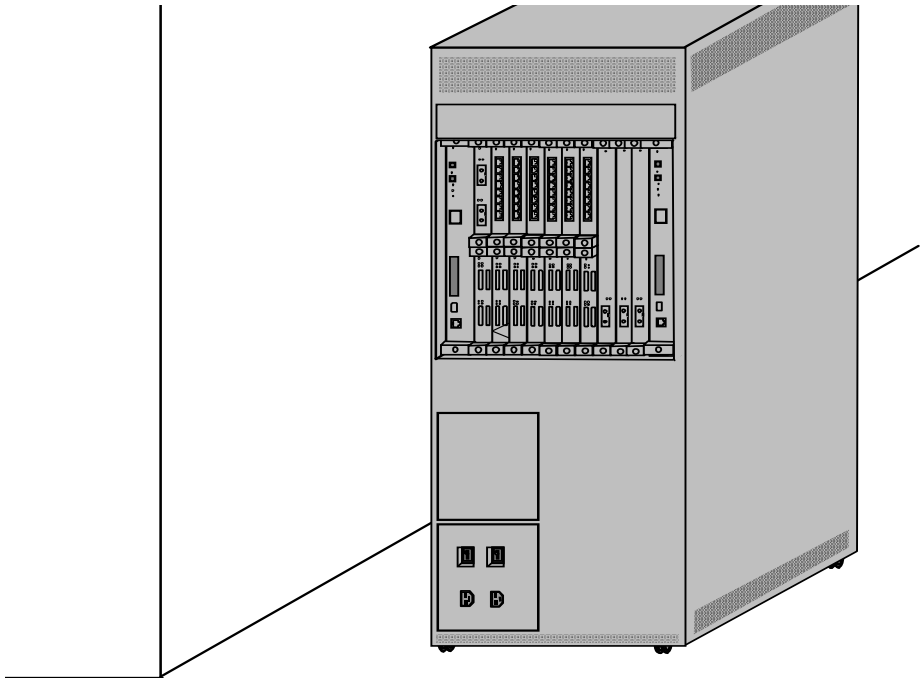


Figure 6-17 Desktop Installation for GR2000-6H

6.3.3 Floor Installation of Chassis

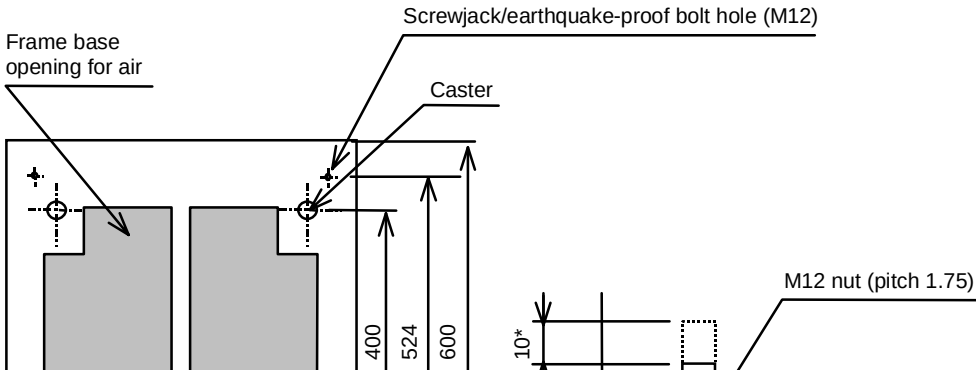
In this style of installation, place the router chassis to meet the minimum service clearance requirements, the cooling requirements, and the general rules as previously mentioned at first. Figure 6-18 through Figure 6-21 illustrate

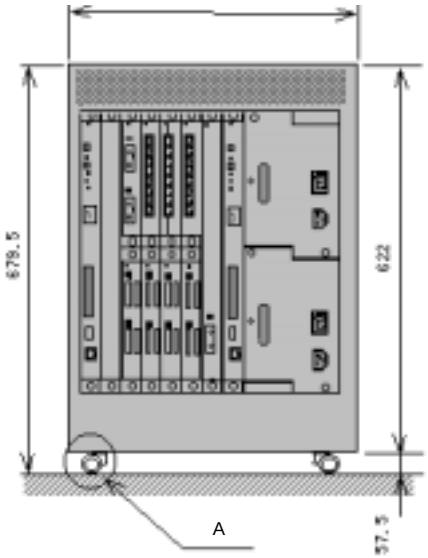


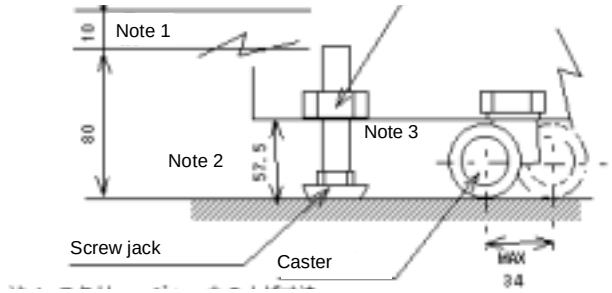


procured earthquake-proof bolts (as necessary). Just locking the casters is allow as a temporary fixation during transportation, but this method is not allowed for installation.

See Figure 6-22 through Figure 6-24 for the locations and dimensions of the screwjacks, earthquake-proof bolt holes, and casters for GR2000-10H, GR2000-2 GR2000-10, and GR2000-20 (unit: mm).



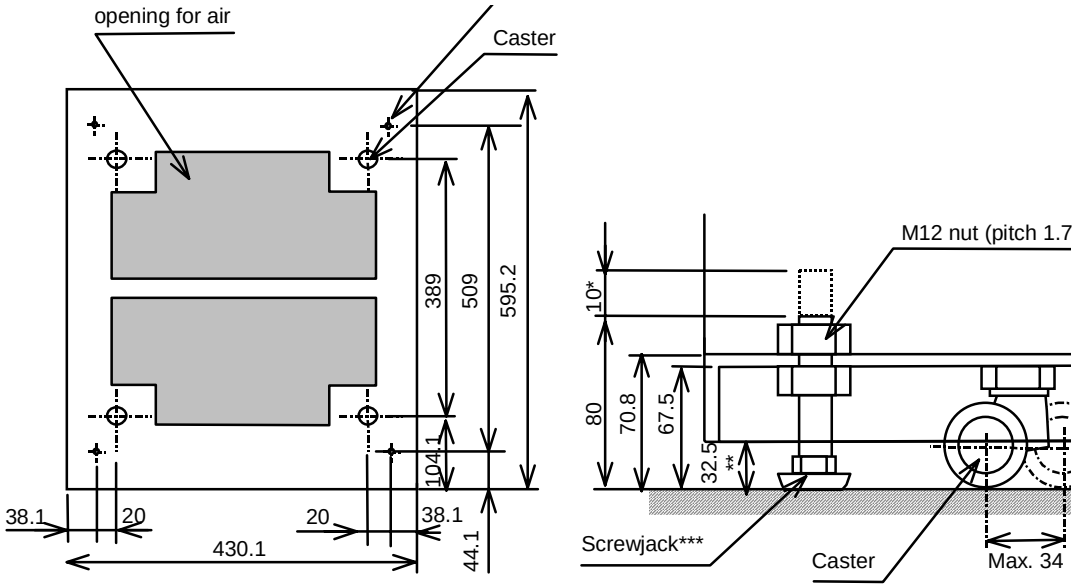




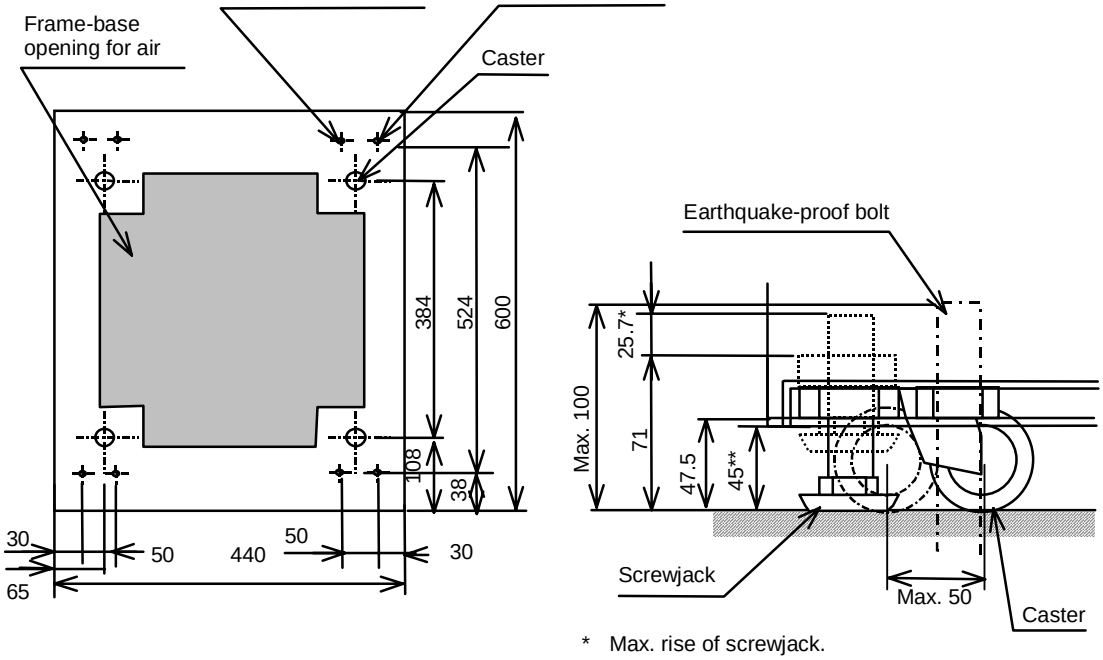
Note 1: Finish size of a screw jack
Note 2: Ensure this because of necessity as air exhaust.
Note 3: Use the screw jack for fixing the device.
(Do not fix it by using the caster lock.)

* When fixing it by using anchor bolts, keep the screw jacks (four) removed. (4) Appearance (5) Section "A"

GR2000-20H



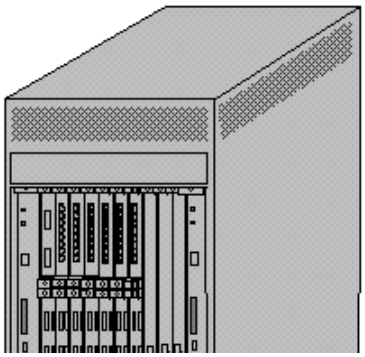
* Max. rise of screwjack.
** Required space for exhaust air.
*** When using earthquake-proof bolts, replace with them all screwja



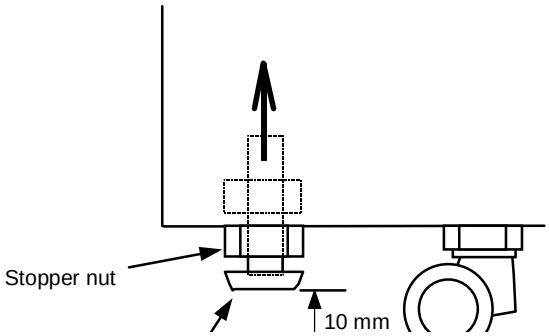
* Max. rise of screwjack.

called UNDER SUPPORT instead of screwjacks. The steps are shown below.

1. Remove the M12 bolts attached or mounted to UNDER SUPPORT, and fasten them temporarily to the M12 bolt holes for the screwjacks.
2. Insert UNDER SUPPORT between the bottom of the router and the M12 bolts
3. Tighten the M12 bolts.



1. Using a wrench, loosen the stopper nut (M12) of each screwjack on the target router; this allows you to adjust the screwjack.
2. Turn the screwjack counterclockwise until it lifts 10 mm from the floor surface.
3. Fasten again the stopper nut attached to each screwjack.
4. Maintaining the resulting screwjack status, move the router.
5. When you reach the destination, fix the location of the router in the reverse order of 1–4. Do not attempt to fix the location of the router by locking the casters.

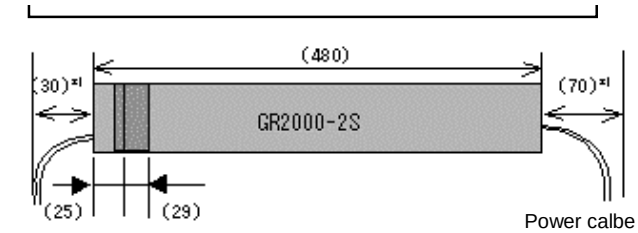


Each GR2000 model can be mounted in a 19-inch rack conforming to JIS and EI standards. When you choose this style of installation, ensure that the rack and t router meet the minimum service clearance requirements, the cooling requiremen and the general rules as previously mentioned. Then, follow one of the procedure below depending on the scale of the subject model: small, medium, or large.

6.3.4.1 Rack-Mount Installation of Small-Scale Chassis—GR2000-2S, GR2000-4, GR2000-4S, GR2000-6H

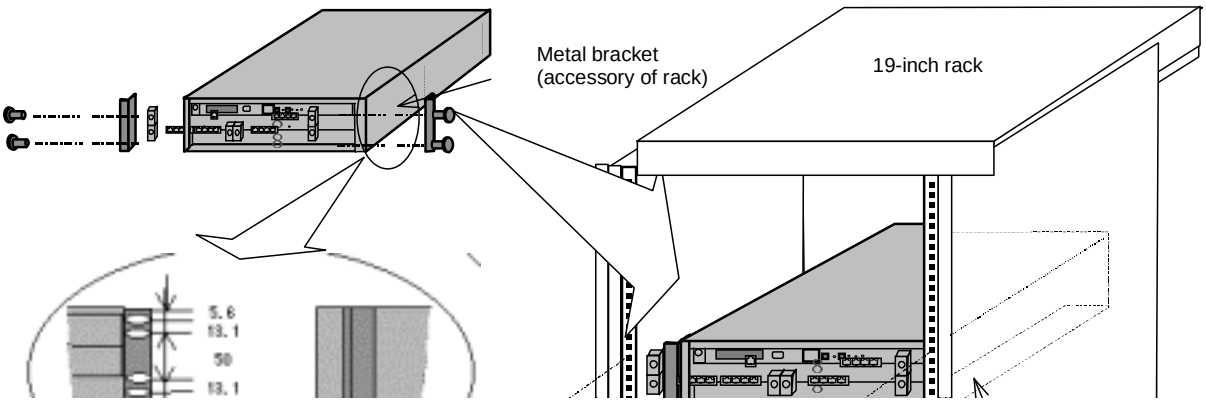
Figure 6-27 to Figure 6-30 show the rack-mount installation of GR2000-2S, GR2000-4, GR2000-4S and GR2000-6H (unit: mm). The steps are as follows:

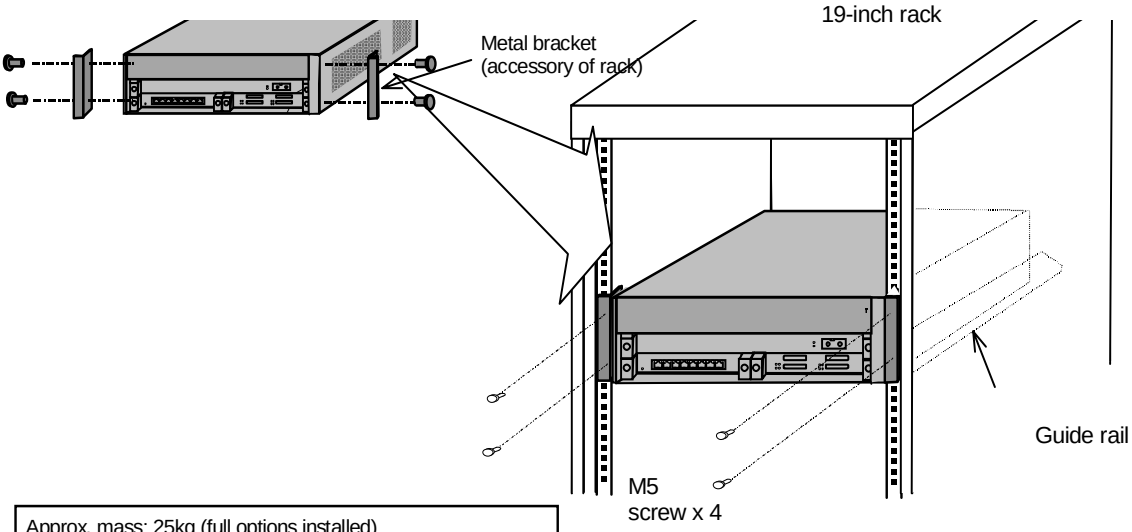
1. Prepare the 19-inch rack, considering the dimensions of the router chassis.
   - The inner depth of the rack must accommodate the depth of the router chassis plus minimum cable clearance (30mm on the front end for interfa cables and 70mm on the rear end for power cables). For GR2000-2S/4S/ (depth 480 mm), the inner depth of the rack must be at least 580mm. For GR2000-4 (depth 600 mm), the inner depth of the rack must be at least 700mm. If a rack with a door is selected, make sure that the distance between the chassis front end and the inner surface of the door satisfies t said minimum cable clearance (30mm).
   -



Interface cable

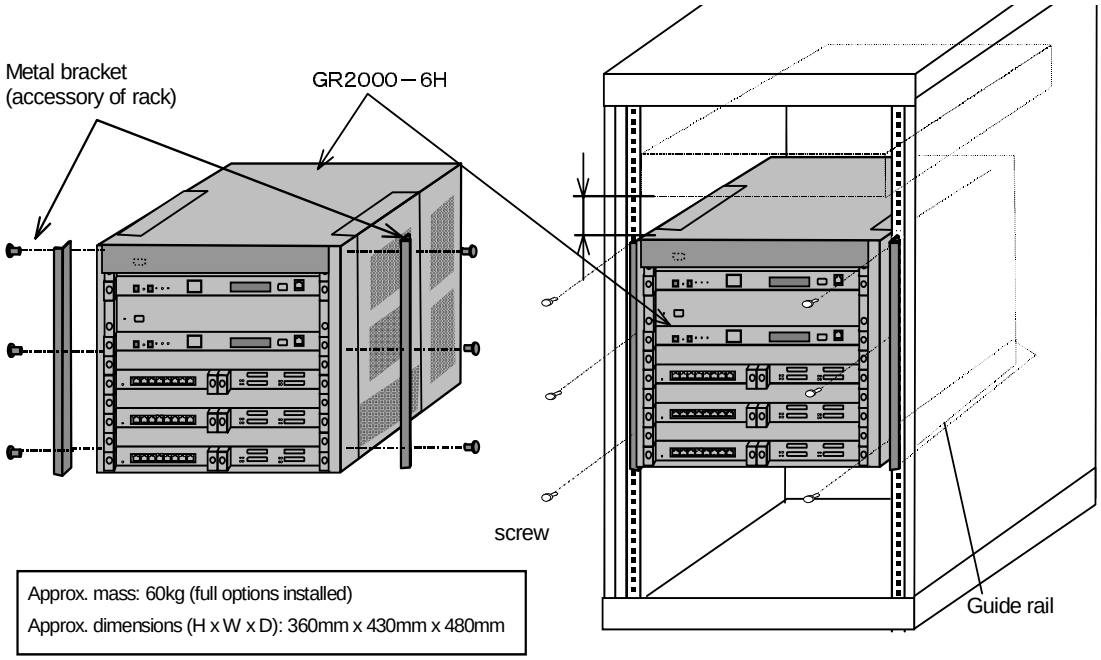
Power calbe





Approx. mass: 25kg (full options installed)
Approx. dimensions (H x W x D): 133mm x 440mm x 480mm
Metal bracket(accessory of rack)

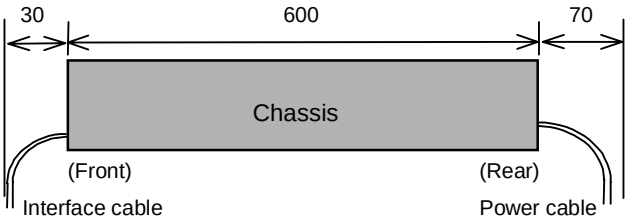
Rack fitting, t2 (Supplied)

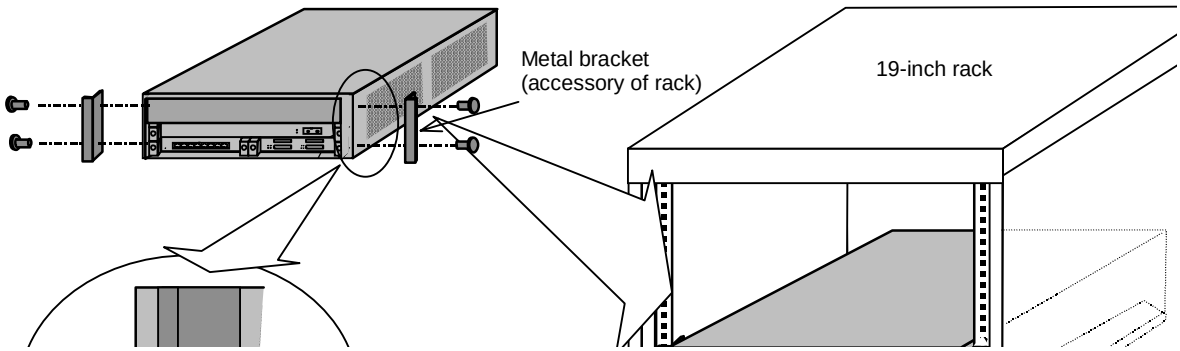


Approx. mass: 60kg (full options installed)

Approx. dimensions (H x W x D): 360mm x 430mm x 480mm

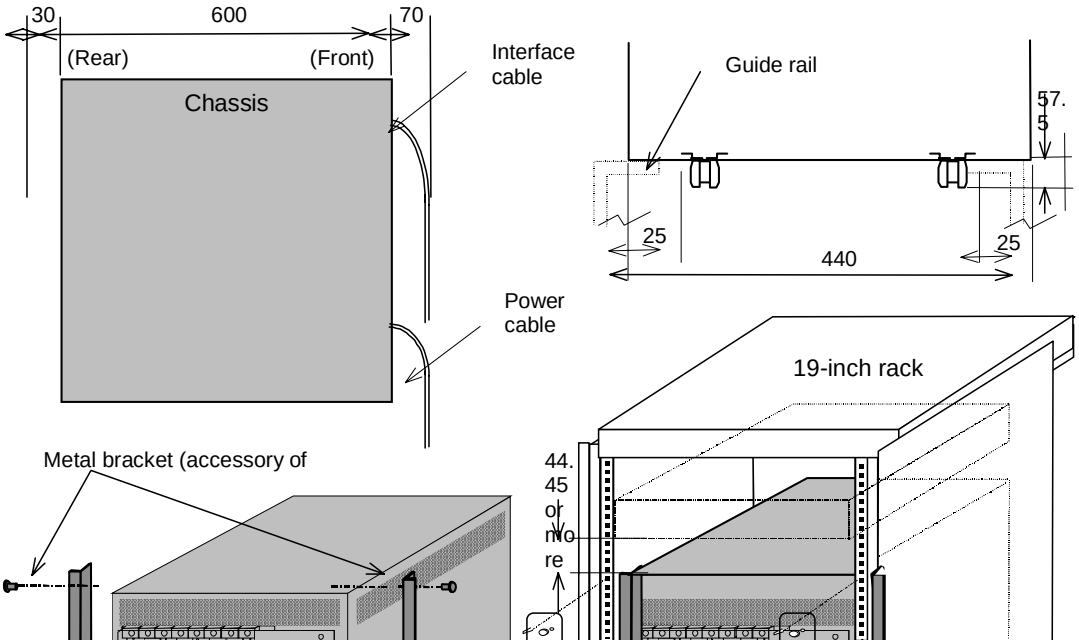
Approx. dimensions (H x W x D): 130mm x 440mm x 600mm



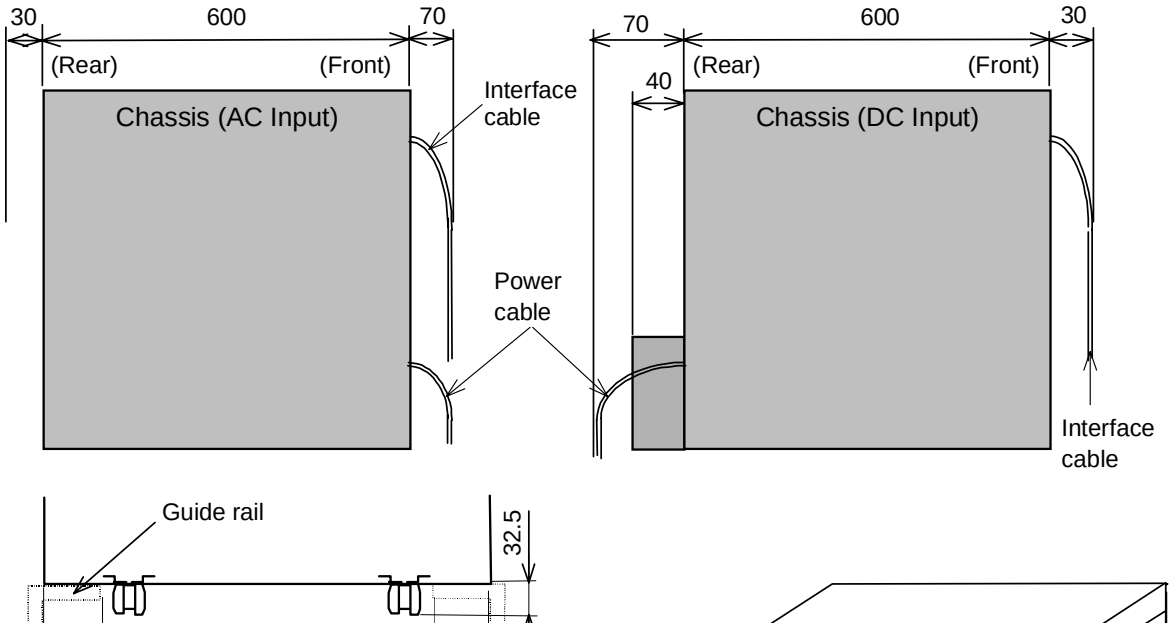


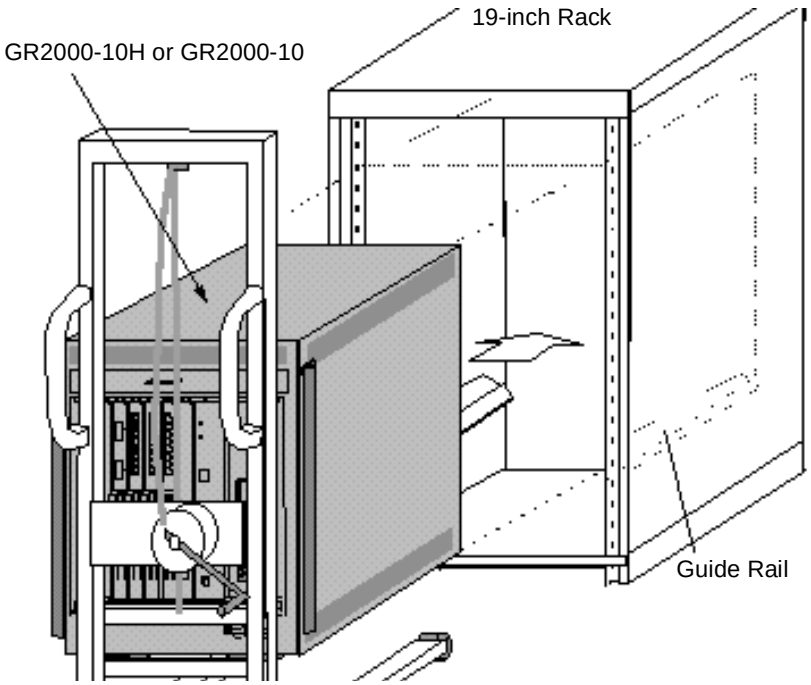
GR2000-10 (unit: mm). The steps are as follows:

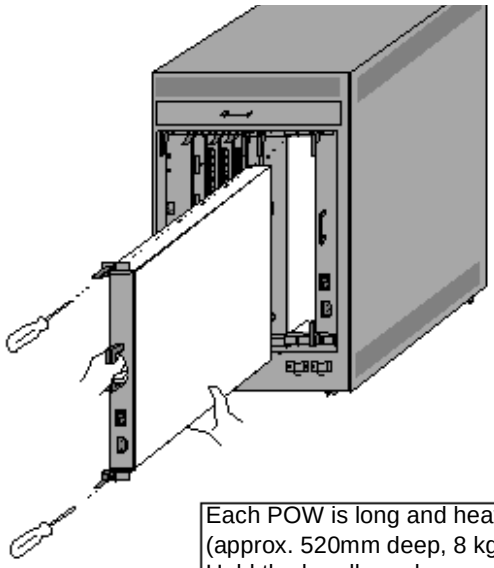
1. Prepare the 19-inch rack, considering the dimensions of the router chassis.
   - The inner depth of the rack must accommodate the depth of the router chassis plus minimum cable clearance (30mm for interface cables and 70mm for power cables) and minimum airway clearance (30mm). For GR2000-10H and GR2000-10 (depth 600 mm), the inner depth of the rack must be at least 700mm. If a rack with a door is selected, make sure that the distance between the chassis front end and the inner surface of the door satisfies the said minimum cable clearance (30mm).
   - The width of the opening of the rack must accommodate the width of the router chassis plus minimum allowance of 10mm for the thickness of metal brackets to be attached to both sides of the chassis. For GR2000-10H and GR2000-10 (width 440 mm), the width of the opening of the rack must be at least 450mm.
2. Mount the load-bearing guide rail (accessory of the rack) on the rack. Make sure that the guide rail can sustain the mass of the chassis (max. 120kg per GR2000-10H and max. 85kg per GR2000-10). Align the guide rails to support the bottom of the chassis and, if another router is to be mounted above this router, to secure a space of 1U (44.45 mm) or more on top of the router when mounted.


30
600
70
(Rear)
(Front)
Chassis
Interface cable
Guide rail
57.5
25
440
25
Power cable
19-inch rack
Metal bracket (accessory of
44.45 or more

Approx. dimensions (H x W x D): 750mm (including caster) x 430mm x 600mm

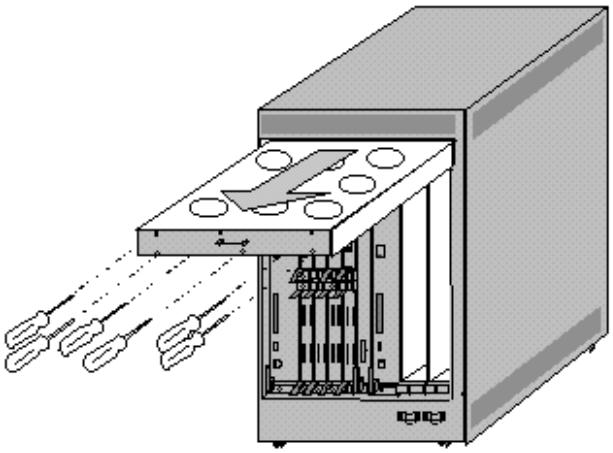



19-inch Rack
GR2000-10H or GR2000-10
Guide Rail



Removing
POW

Each POW is long and heavy (approx. 520mm deep, 8 kg). Hold the handle and support the bottom.

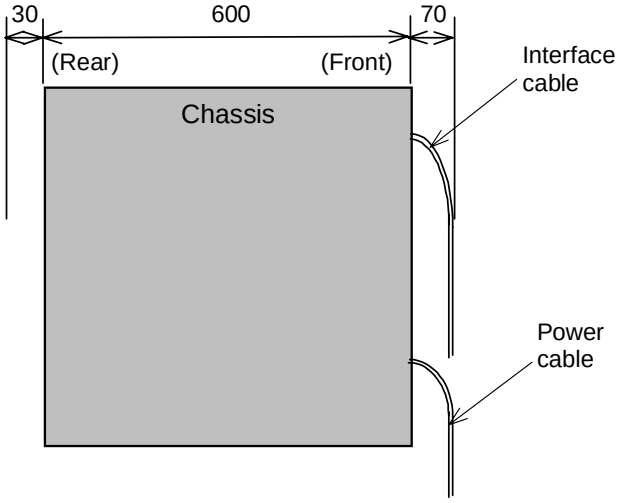


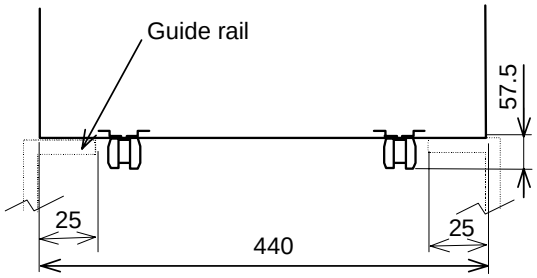
Removing
Fan Tray

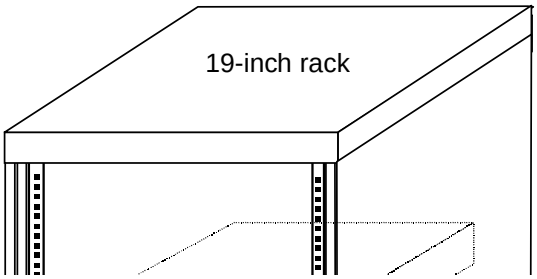
GR2000-20 (unit: mm). The steps are as follows:

1. Prepare the 19-inch rack, considering the dimensions of the router chassis.
   - The inner depth of the rack must accommodate the depth of the router chassis plus minimum cable clearance (30mm for interface cables and 70m for power cables) and minimum airway clearance (30mm). For GR2000-20 and GR2000-20 (depth 600 mm), the inner depth of the rack must be at le 700mm. If a rack with a door is selected, make sure that the distance between the chassis front end and the inner surface of the door satisfies t said minimum cable clearance (30mm).
   - The width of the opening of the rack must accommodate the width of the router chassis plus minimum allowance of 10mm for the thickness of me brackets to be attached to both sides of the chassis. For GR2000-20H and GR2000-20 (width 440 mm), the width of the opening of the rack must be least 450mm.
2. Mount the load-bearing guide rail (accessory of the rack) on the rack. Make s that the guide rail can sustain the mass of the chassis (max. 160kg per GR2000-20H and max. 190kg per GR2000-20). Align the guide rails to suppo the bottom of the chassis and, if another router is to be mounted above this router, to secure a space of 1U (44.45 mm) or more on top of the router when mounted.

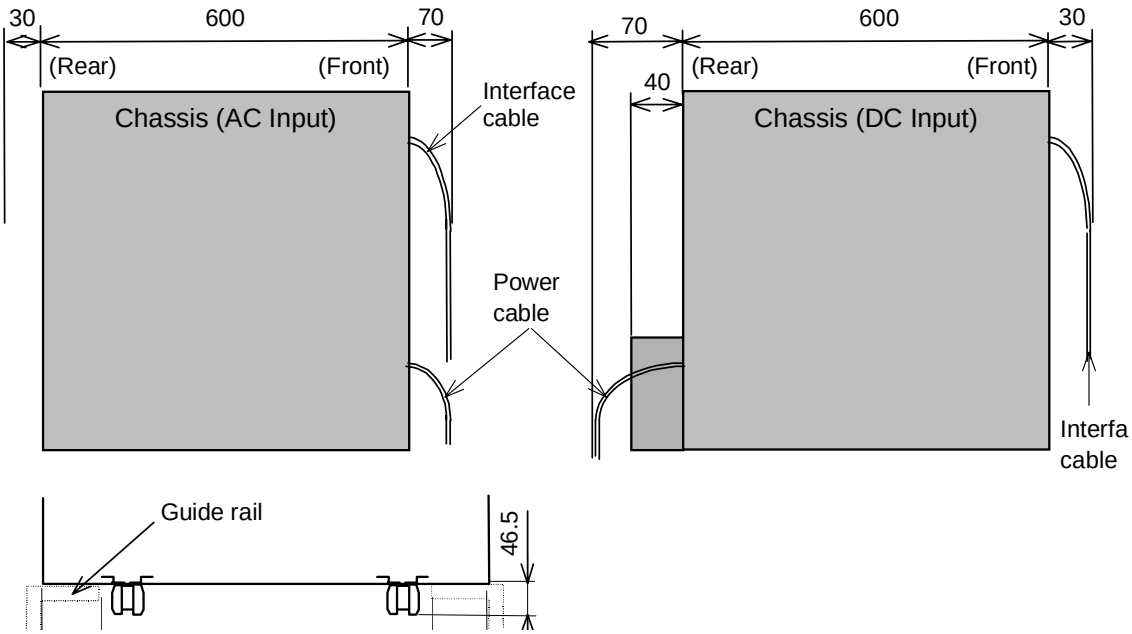
Approx. dimensions (H x W x D): 890mm (excluding caster) x 440mm x 600mm

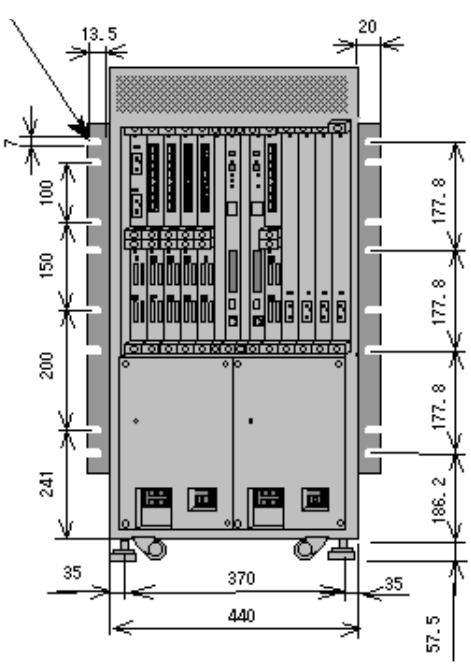


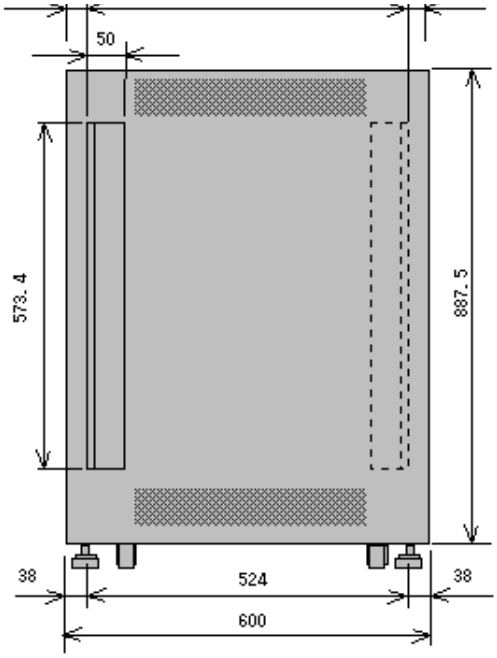


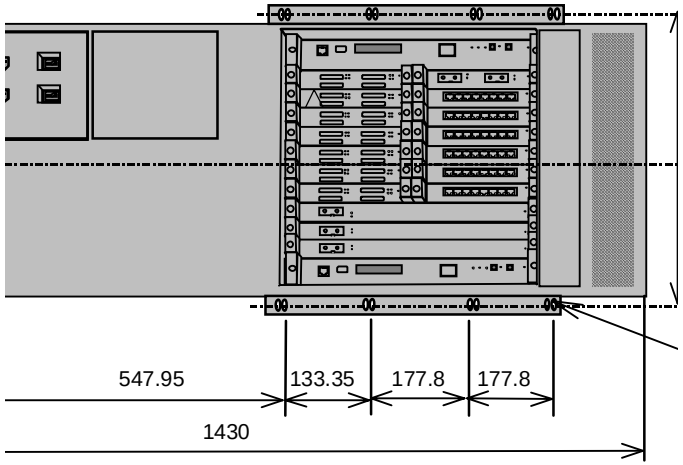


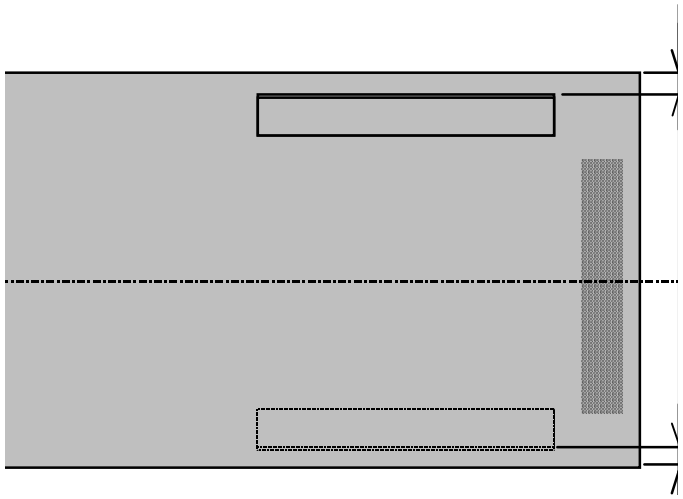
Approx. dimensions (H x W x D): 1430mm (including caster) x 44...m x 600mm

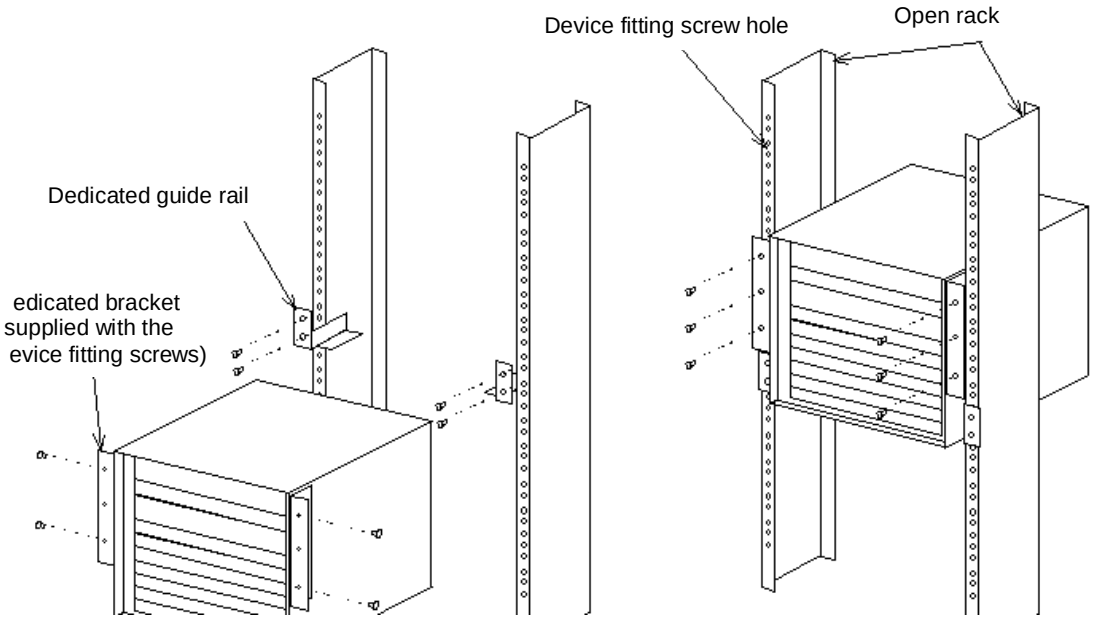


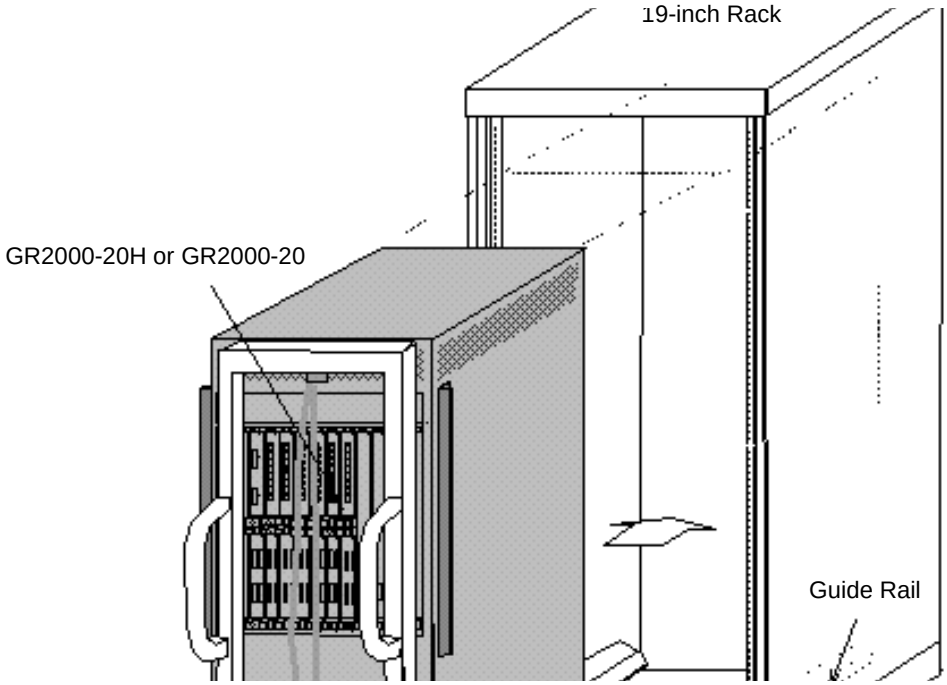

13.5
20
7
100
150
200
241
177.8
177.8
177.8
186.2
35
370
35
440
57.5


50
573.4
887.5
38
524
38
600


547.95
133.35
177.8
177.8
1430




Device fitting screw hole
Open rack
Dedicated guide rail
edicated bracket
supplied with the
evice fitting screws)


19-inch Rack
GR2000-20H or GR2000-20
Guide Rail

This section describes how to route and connect the two types of cables to be connected to GR2000, i.e., input power cables and interface cables.

6.4.1 General Rules for Routing and Connection of Cables

Regardless of the kind of cables, the following must be observed when you route and connect the cables:

- Protect cables by running them through a duct or by using a braid. Especially for optical fiber cables, a cord bend radius of at least 100mm in length and 50mm in breadth and a metal braid should be used.
- For an optical fiber cord, leave a 3m length of cord for maintenance. Wind the rest of the cord and store it near the router.
- If an optical fiber cord and other types of interface cables coexist, do not stress the optical fiber cord.
- On a floor-installed GR2000 model of medium scale or large scale, do not route a cable in such a manner that the cable obstructs the board replacement on the own model. Route the cable properly as shown in Figure 6-40.
- On a rack-mounted GR2000 model of small scale through large scale, do not route a cable in such a manner that the cable obstructs the board replacement

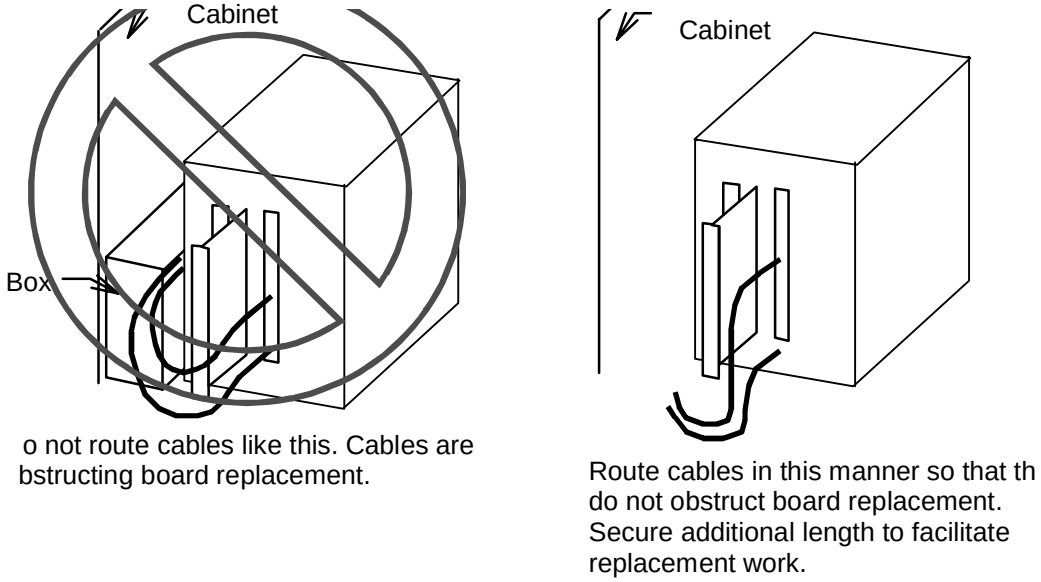
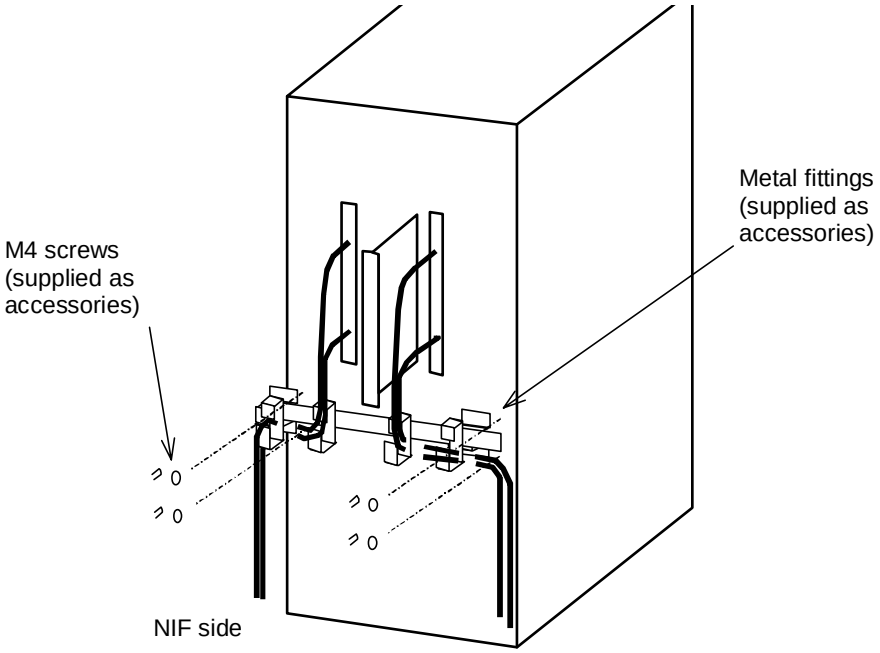


Figure 6-40 Prohibited vs. Preferred Cable Routing on Floor-Installed GR2000


M4 screws
(supplied as
accessories)
Metal fittings
(supplied as
accessories)
NIF side

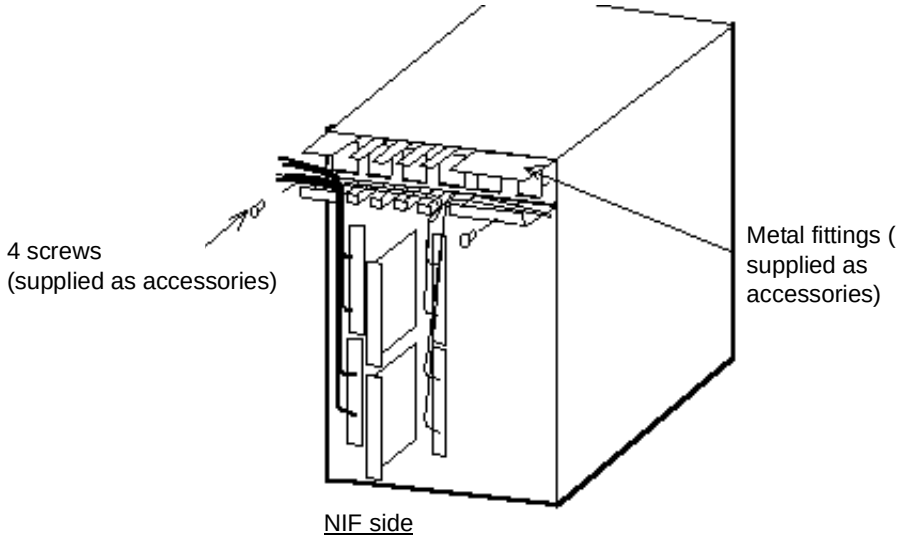


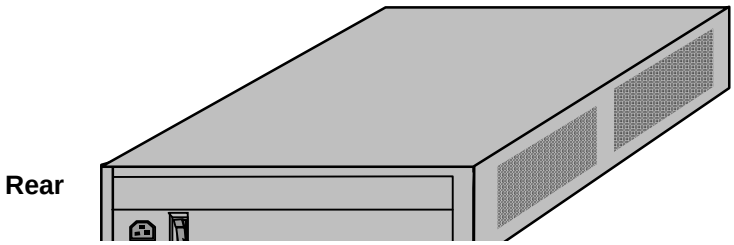
Figure 6-44 Fixation of Cables on Large-Scale Models Using Metal Fittings (GR2000-10H)

This subsection shows you how to connect input power cables to specific models of GR2000-2S, GR2000-10H, GR2000-20H, GR2000-4, GR2000-10, and GR2000-20.

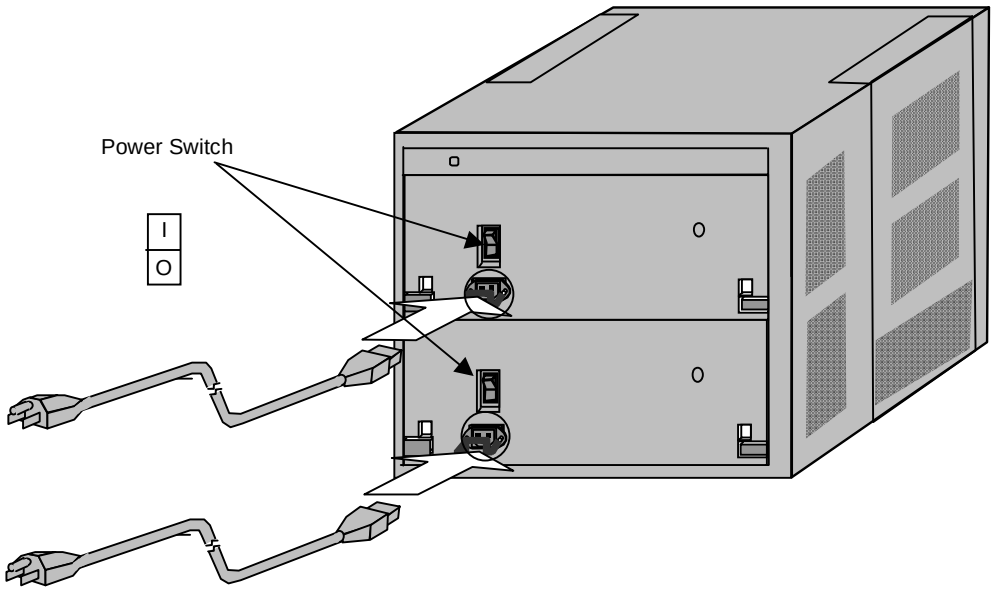
6.4.2.1 GR2000-2S

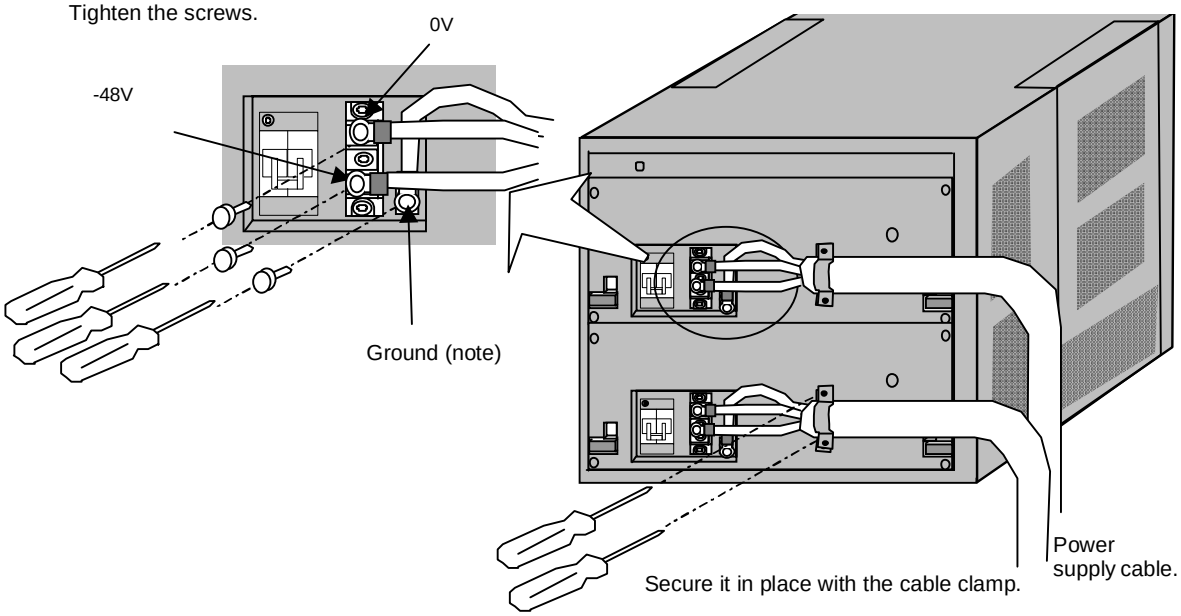
Figure 6-46 shows how to connect the input power cable to GR2000-2S, which accepts only AC input (100V or 200V). The steps are as follows:

1. Ensure that the power switch in the rear end of the chassis is in the O (out) position.
2. Insert the receptacle on the input power cable firmly to the plug adjacent to the power switch.



Connect both power cables if there is a redundant power supply.

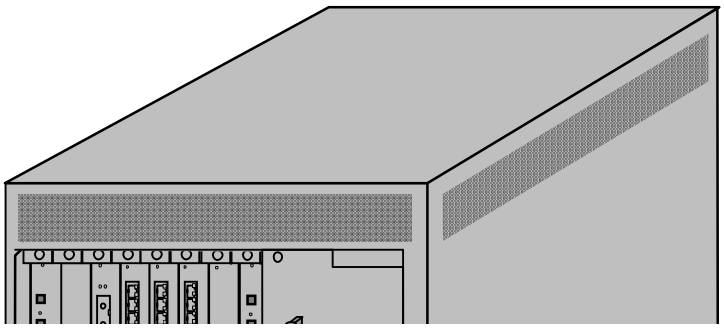




Note: Due to the difference in level, the ground connection is connected to the terminal from above

Figure 6-47 shows how to connect the AC input power cable to GR2000-10H. Th steps are as follows:

1. Ensure that the power switch (for 200V input) or the breaker switch (for 100V input) in the front end of the chassis is in the O (out) position. When the pow supply is duplexed (redundant), make sure in two positions.
2. Insert the receptacle on the input power cable firmly to the plug beneath the power switch. When the power supply is duplexed, do this in two positions.



this connection work requires expertise, the work must be conducted by qualified personnel. The steps are as follows:

1. Procure the DC input power cable in compliance with the specifications shown below. When the power supply is duplexed (redundant), procure two cables.
   - Cord structure: 3-wire
   - AWG No. of each conductor (determined by ampacity): 8
   - Cord diameter (determined by cable clamp): 23mm or smaller
   - Size of wire-binding screw on terminal board: M5
2. Ensure that the breaker switch in the front end of the chassis is in the O (out) position. When the power supply is duplexed, make sure in two positions.
3. Connect each terminal wire of the input power cable firmly to the terminal board and the ground. See Figure 6-49 for the dimensions of the terminal board and the terminal wire. When the power supply is duplexed, repeat the connection work in two positions.
4. Fix the input power cable with the cable clamp (not illustrated). When the power supply is duplexed, repeat the fixation in two positions.

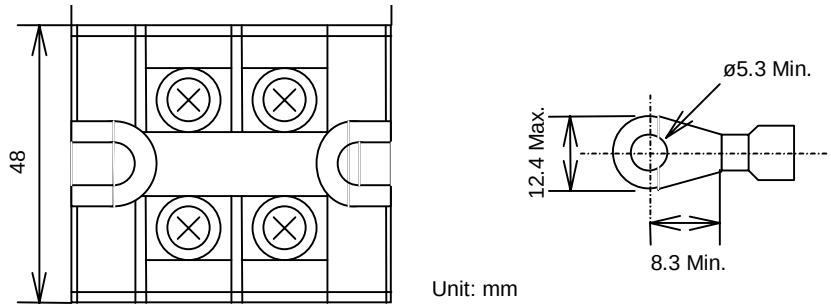


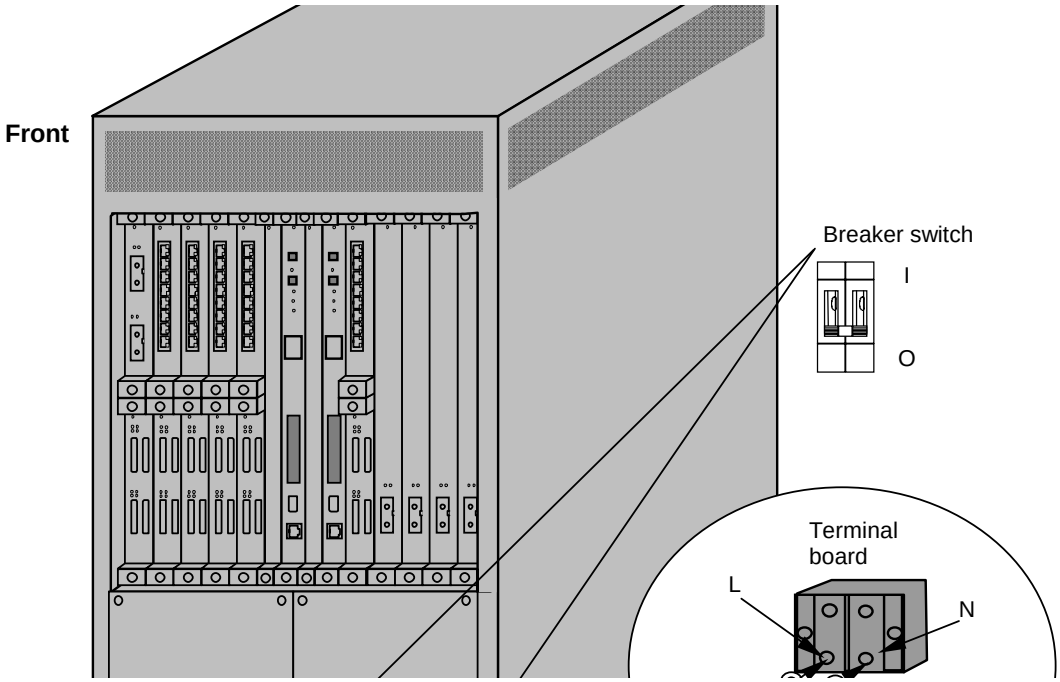
Figure 6-49 Terminal Board/Wire Dimensions for DC Input to GR2000-10H

6.4.2.5 GR2000-20H

200V AC Input

Figure 6-50 shows how to connect the AC input power cable to GR2000-20H. Th steps are as follows:

1. Prepare the AC input power cable supplied with the device. The cable complie


Front
Breaker switch
I
O
Terminal
board
L
N

this connection work requires expertise, the work must be conducted by qualified personnel. The steps are as follows:

1. Procure the DC input power cable in compliance with the specifications show below. When the power supply is duplexed (redundant), procure two cables.
   - Cord structure: 3-wire
   - AWG No. of each conductor (determined by ampacity): 6
   - Cord diameter (determined by cable clamp): 27mm or smaller
   - Size of wire-binding screw on terminal board: M6
2. Ensure that the breaker switch in the front end of the chassis is in the O (ou position. When the power supply is duplexed, make sure in two positions.
3. Connect each terminal wire of the input power cable firmly to the terminal bo and the ground. See Figure 6-53 for the dimensions of the terminal board an the terminal wire. When the power supply is duplexed, repeat the connection work in two positions.
4. Fix the input power cable with the cable clamp (not illustrated). When the po supply is duplexed, repeat the fixation in two positions.

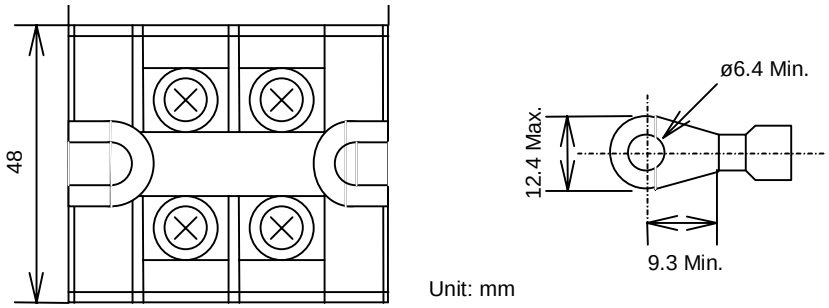


Figure 6-53 Terminal Board/Wire Dimensions for DC Input to GR2000-20H

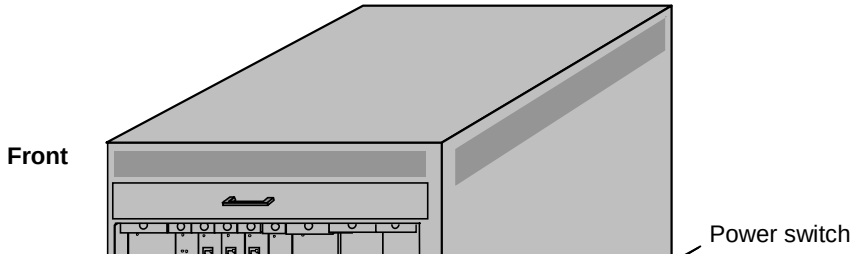
6.4.2.6 GR2000-4

Figure 6-54 shows how to connect the input power cable to GR2000-4, which accepts only AC input (100V or 200V). The steps are as follows:

1. Ensure that the power switch in the rear end of the chassis is in the O (out) position. When the power supply is duplexed (redundant), make sure in two positions.

Figure 6-55 shows how to connect the AC input power cable to GR2000-10. The steps are as follows:

1. Ensure that the power switch in the front end of the chassis is in the O (out) position. When the power supply is duplexed (redundant), make sure in two positions.
2. Insert the receptacle on the input power cable firmly to the plug beneath the power switch. When the power supply is duplexed, do this in two positions.
3. If necessary, fix the input power cable with the cable clamp. When the power supply is duplexed, repeat the fixation in two positions.



this connection work requires expertise, the work must be conducted by qualified personnel. The steps are as follows:

1. Procure the DC input power cable in compliance with the specifications shown below. When the power supply is duplexed (redundant), procure two cables.
   - Cord structure: 3-wire
   - AWG No. of each conductor (determined by ampacity): 10
   - Cord diameter (determined by cable clamp): 16mm or smaller
   - Size of wire-binding screw on terminal board: M5
2. Ensure that the breaker switch in the front end of the chassis is in the O (out) position. When the power supply is duplexed, make sure in two positions.
3. In the rear end of the chassis, detach the cover from the input unit and connect each terminal wire of the input power cable firmly to the terminal board and the ground. See Figure 6-57 for the dimensions of the terminal board and the terminal wire. When the power supply is duplexed, repeat the connection work in two positions.
4. Fix the input power cable with the cable clamp. When the power supply is duplexed, repeat the fixation in two positions. Then, attach the cover back to the input unit.

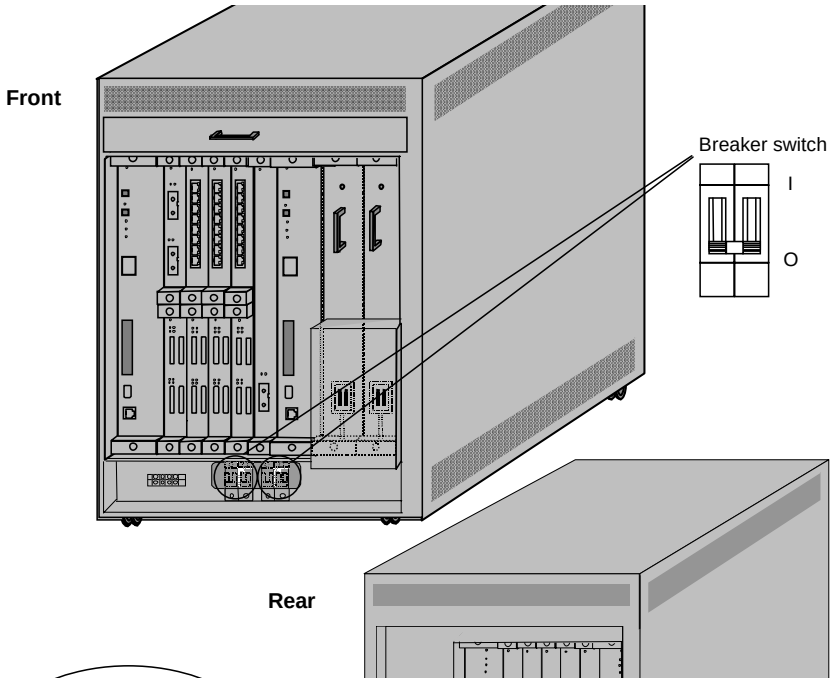
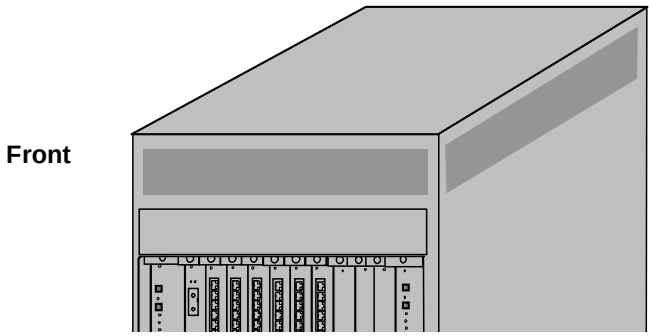

Front
Breaker switch
I
O
Rear

Figure 6-58 shows how to connect the AC input power cable to GR2000-20. The steps are as follows:

1. Ensure that the power switch in the front end of the chassis is in the O (out) position. When the power supply is duplexed (redundant), make sure in two positions.
2. Insert the receptacle on the input power cable firmly to the plug beneath the power switch. When the power supply is duplexed, do this in two positions.



this connection work requires expertise, the work must be conducted by qualified personnel. The steps are as follows:

1. Procure the DC input power cable in compliance with the specifications show below. When the power supply is duplexed (redundant), procure two cables.
   - Cord structure: 3-wire
   - AWG No. of each conductor (determined by ampacity): 6
   - Cord diameter (determined by cable clamp): 27mm or smaller
   - Size of wire-binding screw on terminal board: M5
2. Ensure that the breaker switch in the rear end of the chassis is in the O (out position. When the power supply is duplexed, make sure in two positions.
3. Detach the cover from the input unit and connect each terminal wire of the in power cable firmly to the terminal board and the ground. See Figure 6-60 for dimensions of the terminal board and the terminal wire. When the power sup is duplexed, repeat the connection work in two positions.
4. Fix the input power cable with the cable clamp. When the power supply is duplexed, repeat the fixation in two positions. Then, attach the cover back to input unit.

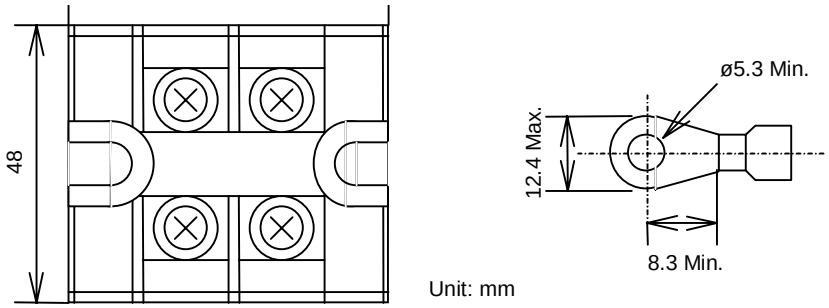


Figure 6-60 Terminal Board/Wire Dimensions for DC Input to GR2000-20

6.4.3 Connection of Interface Cables

This subsection depicts how to connect interface cables to the own router, assuming that such cables are already routed. Make sure that the general rules for cabling in Subsection 6.4.1 are satisfied.

or 1000BASE-LH cable connector (SC 2-core) to the mating receptacle on the own router.

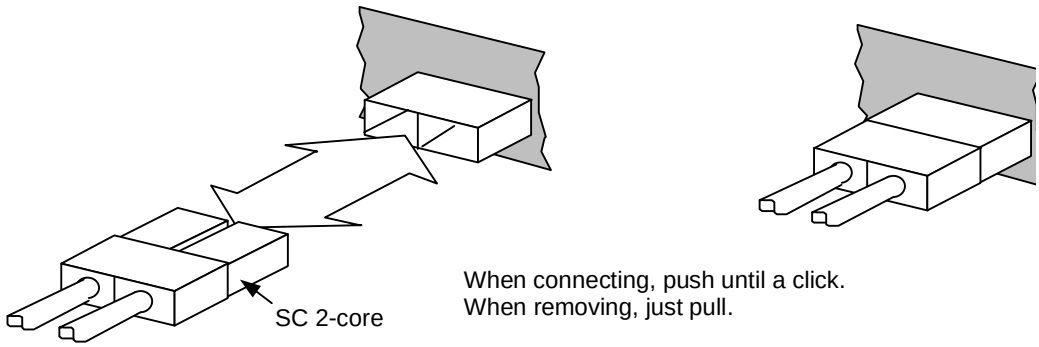
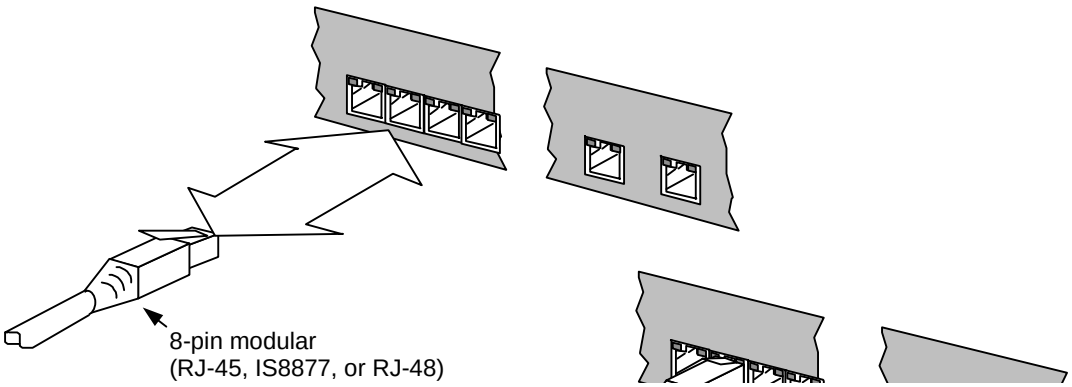


Figure 6-62 Connection of 100BASE-FX, 1000BASE-SX, 1000BASE-LX, or 1000BASE Cable Connector (SC 2-core)

6.4.3.3 WAN: V.24, V.35, and X.21

RJ-48) to the mating receptacle on the own router.

Caution: **10BASE-T, 100BASE-TX, WAN (BRI/PRI), and 25Mbps ATM all use the same 8-pin modular connector. Ensure the same interface type between the connector and the receptacle prior to physical connection. A mismatch may cause malfunction or a failure.**



connector (SC 2-core) to the mating receptacle on the own router.

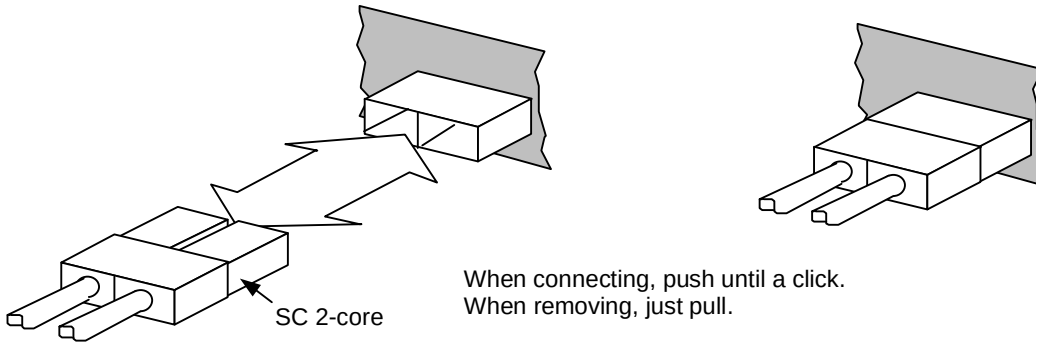


Figure 6-66 Connection of OC-3c POS, OC-12c POS, or OC-48c POS Cable Connect (SC 2-core)

6.4.3.7 ATM/MMF/SMF: OC-3c ATM/MMF, OC-3c ATM/SMF, OC-12c/ATM/MMF and OC-12c ATM/SMF

mating receptacle on the own router.

Caution: **10BASE-T, 100BASE-TX, WAN (BRI/PRI), and 25Mbps ATM all use the same 8-pin modular connector. Ensure the same interface type between the connector and the receptacle prior to physical connection. A mismatch may cause malfunction or a failure.**

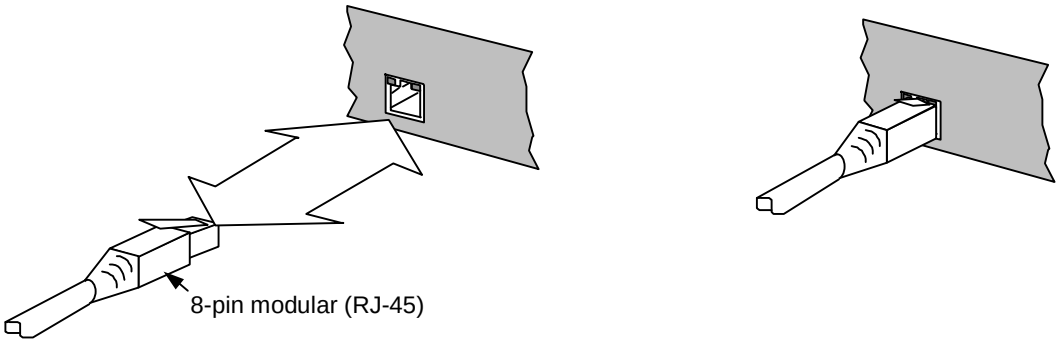
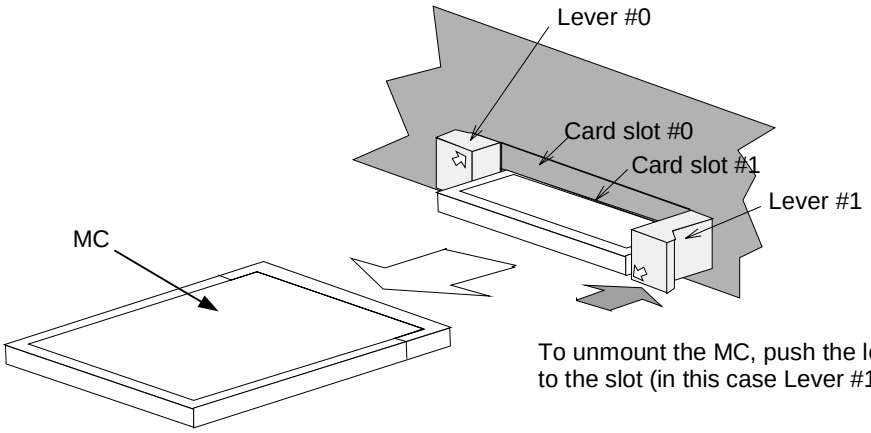


Figure 6-70 illustrates how to unmount an MC.

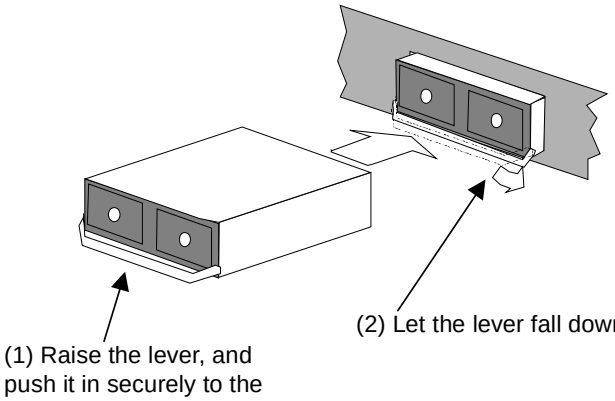
Note: When the setup console is connected, access to Lever #1 may be difficult because this lever is adjacent to the console port. In such a case, temporarily disconnect the console cable and operate the lever.



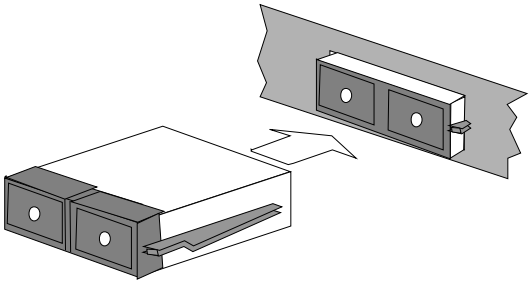
To unmount the MC, push the lever correspond to the slot (in this case Lever #1).

Methods of fitting/removing the GBIC to NEIG-4C are described below:

- How to fit.



In case of Module A



In case of Module B

- How to remove.

After the hardware installation is complete, initial setup of this router from the se console is mandatory. To prepare for this operation, connect the setup console to router's RS-232C port with a cross cable having 9-pin D-sub female connectors o both ends. Figure 6-71 below shows an example with GR2000-10. If the router's B is duplexed, then the router has two ports for the setup console connection, activ and standby.

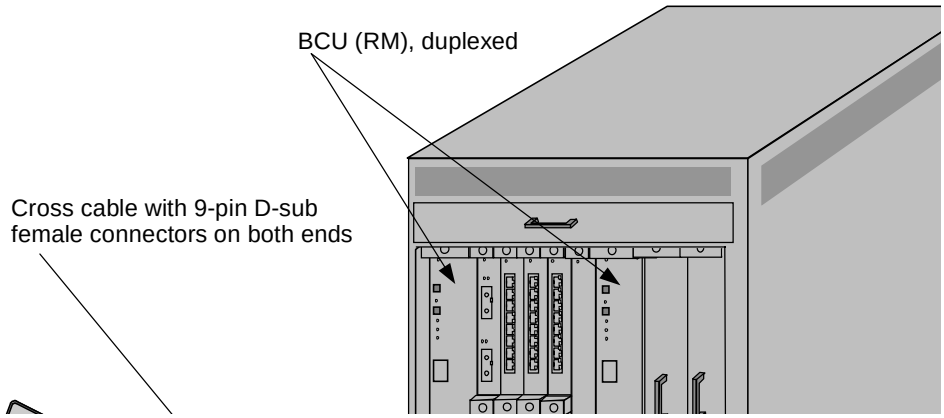


Table 6-2 Console specifications

Item	Specifications
Communication parameter	8 bits and 1 stop bit, without parity.
Communication speed	19.2 kbps 9600 bps 4800 bps 2100 bps 1200 bps

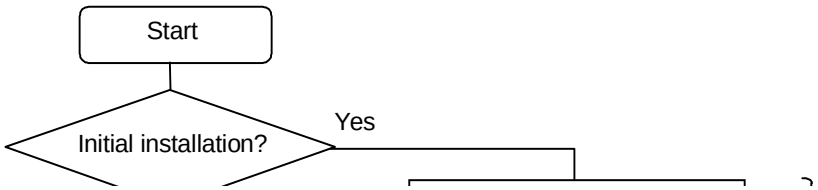
The communication speed varies depending on the port connected to the console. When connecting the console to CONSOLE (RS232C), the communication speed can be selected from the above table. The standard speed is 9600bps.
The communication speed when the console is connected to AUX is 9600bps.

The cable to connect the console with this devices is the RS-232C cross cable.
The connector on this device side is the D-SUB CON female of 9 pins.

Starting, Setting Up, and Stoppin

7.1 Overview of Device Operation

Figure 7-1 provides a sequence of operating this device.



Starting the own router is performed by turning on the power switch or the power breaker on each router chassis. See Subsection 6.4.2 for the locations and in/out positions of these power switches and breaker switches. Pay attention to the following Notes.

Note: When you turn off and turn on the same router power successively, pause at least 2 seconds before you turn on the power.

Note: For a router with duplexed (redundant) power supply, turn on the two power/breaker switches one after the other within 10 seconds.

Note: When turning on a breaker switch, make sure you move the lever switch fully until it stops.

When the hardware installation is complete, you must configure the system to st operation. The steps are as follows:

1. Login at first time. Log in to this device from the setup console. At the initial lo attempt, the following appears as the default login account:
   - Login name: `operator`
   - Password: (none)

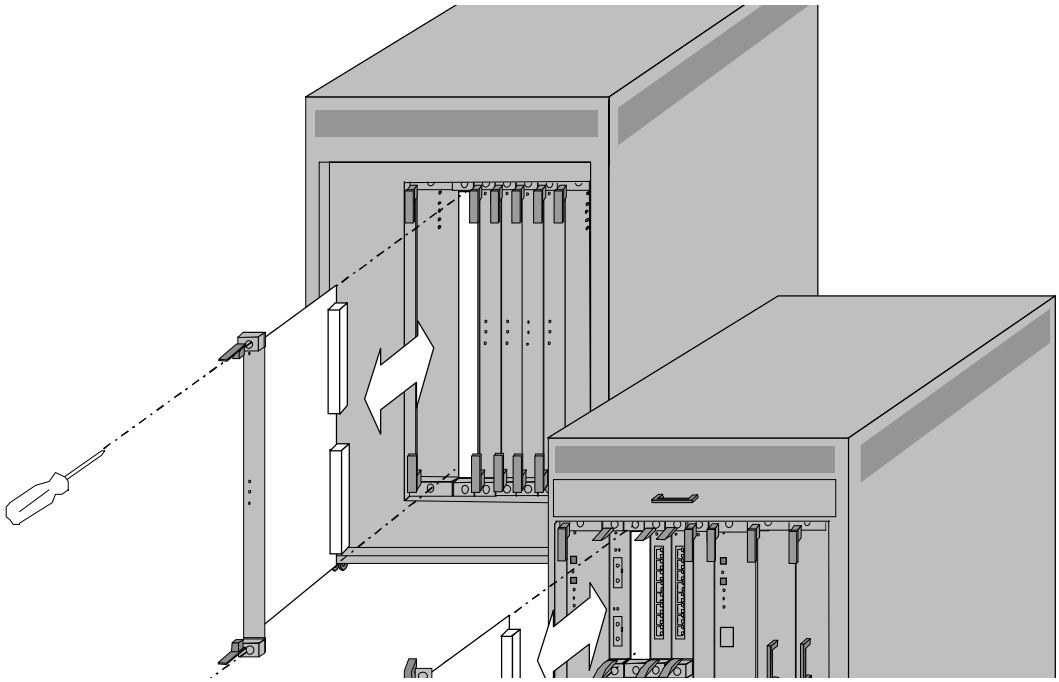
   To prevent security breaches, it is recommended that you login as the router administrator (`admin`), create a new account using adduser command, and the delete the default account using rmuser command. See *GR2000 Operations Gu* for more information.
2. Set up the configuration information. The configuration information defines t operating environment, such as the IP addressing, type of network media, routing protocol, and so on. The configuration information can be defined usi commands and the GUI. Be sure to save the configuration information to a fi At startup, the system uses the last-used configuration information file. For individual commands and parameters, see *GR2000 Configuration Guide*.
3. Set up the date and time. The date and time information is used as timestam for events in the log information and creation of files. Before you start product use of the router, set the date and time to correct values using date command (see *GR2000 Operations Guide*).

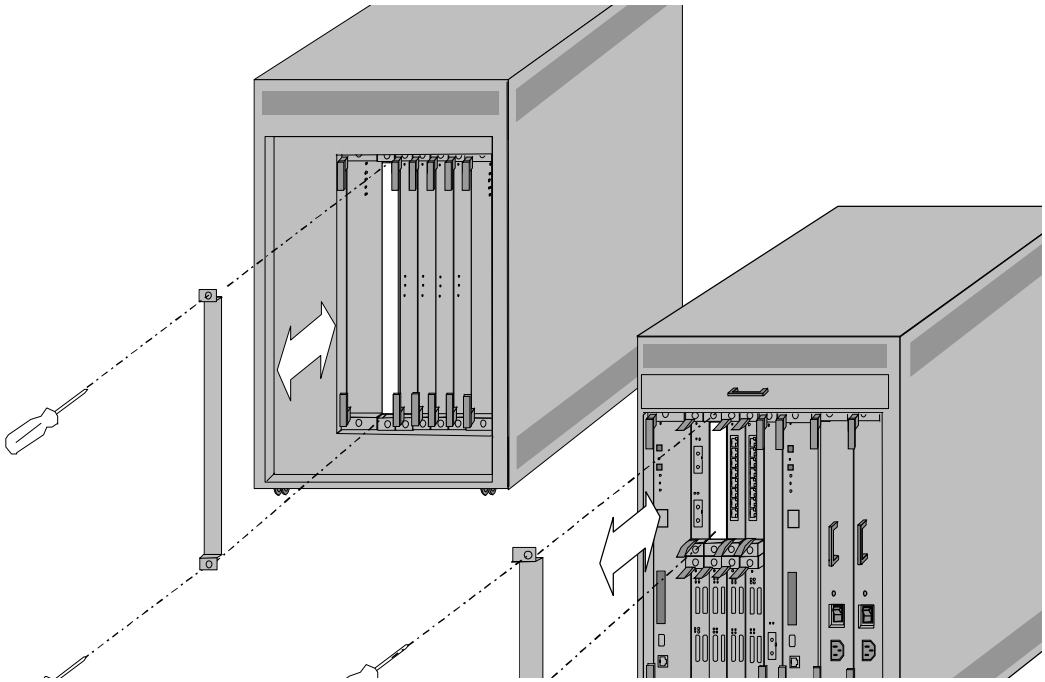
Adding and Removing Component

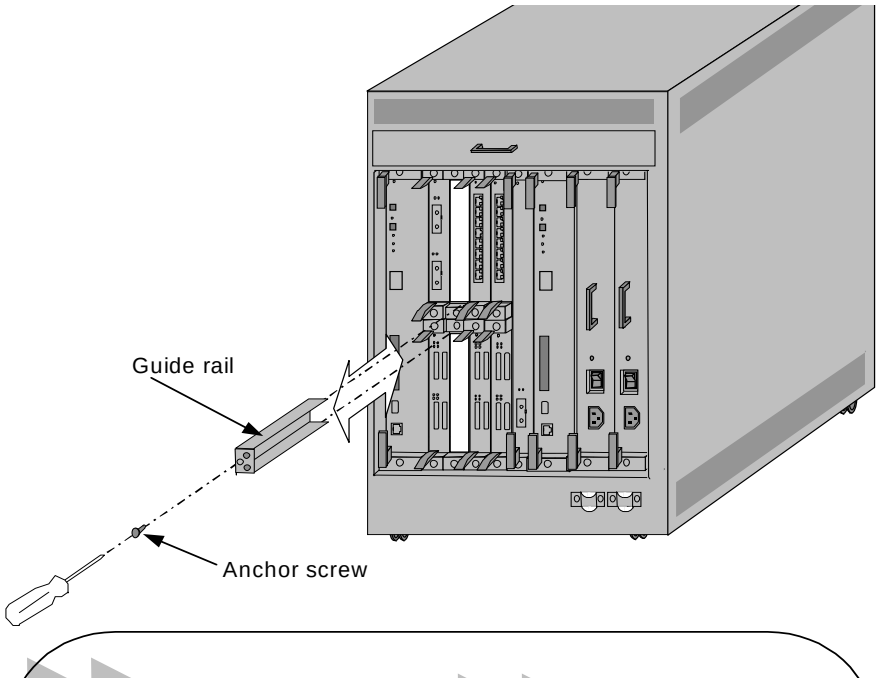
The user's own addition and removal of components is available on this router, basically while the router power is off. In addition, under certain conditions, components can be added and removed while the router power is on. This hot-swapping capability and its procedures for applicable components are descri in the last section in this chapter. The other sections in this chapter illustrate addition/removal procedures for components, assuming that the router power is

8.1 BCU, RP, and NIF Modules

To add or remove the BCU (RM-CPU, RM-IO, and CSW if applicable), RP, and NIF






Guide rail
Anchor screw

To add or remove the power supply components to/from each model of GR2000 ot than GR2000-2S, refer to the following subsections.

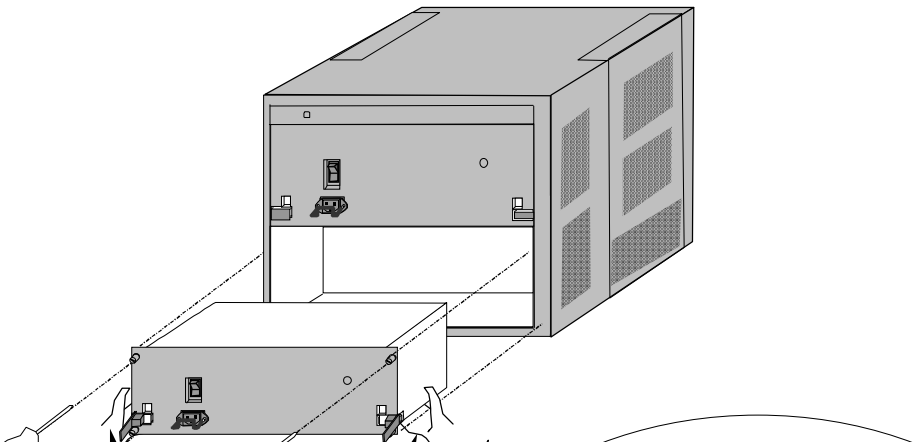
Note: The power supply module of GR2000-2S cannot be added or removed by the user because they are integral to chassis. When addition or removal of such a module is necessitated on GR2000-2S, entrust work to trained service personnel.

Note: For models other than GR2000-2S, certain power supply components cannot be added or removed by the user. For power supply components not described in this section, entrust work to trained service personnel.

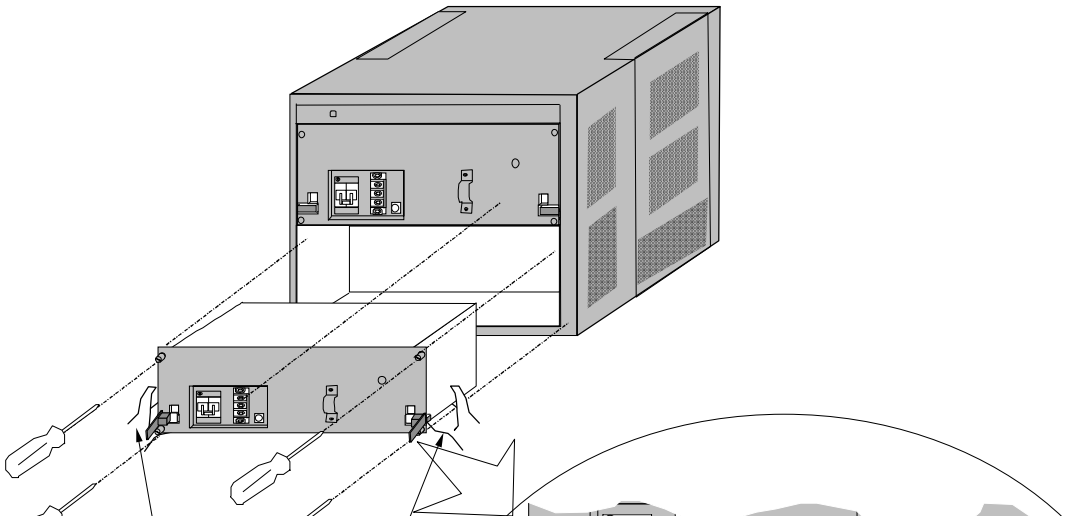
8.2.1 GR2000-4S

- Turn off the power switch on the back panel, release the cable retainer and remove the power cord.

Caution: **The power source unit is heavy (about 8kg); be sure to support it firmly from below with both hands when installing or removing.**

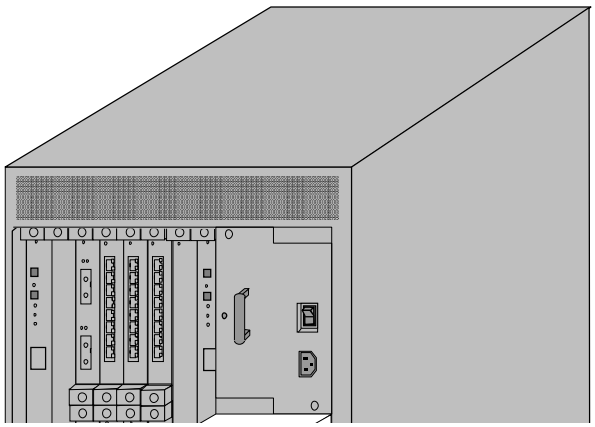


Caution: **The power source unit is heavy (about 8kg); be sure to support it firmly from below with both hands when installing or removing.**

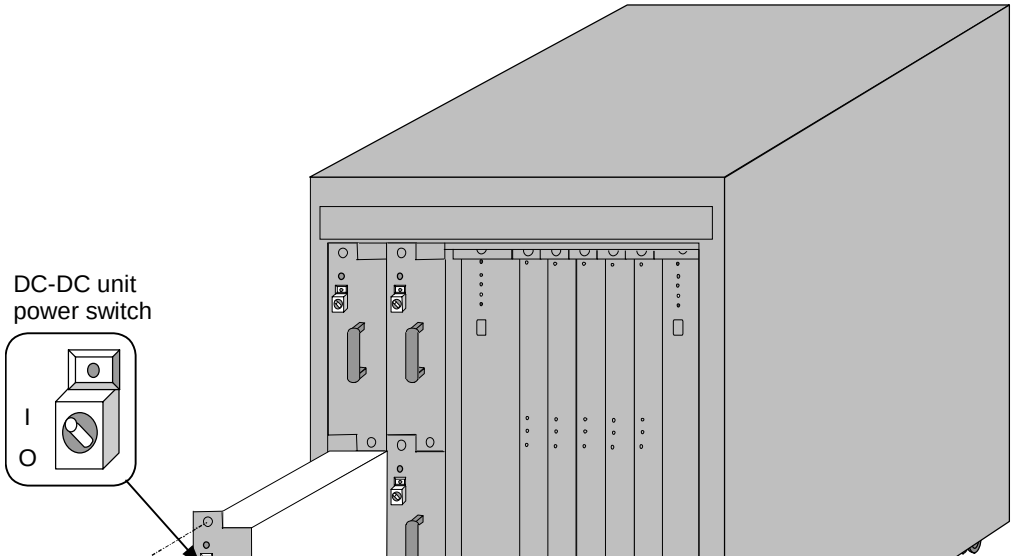


8.2.3.1 Input Unit (AC or DC)

1. Turn off the power switch (AC input) or the breaker switch (DC input) on the Input Unit and unplug the power cord from the Input Unit.
2. Follow the instructions illustrated in Figure 8-4. Although the figure shows the case of AC input, the same instructions apply to the case of DC input.

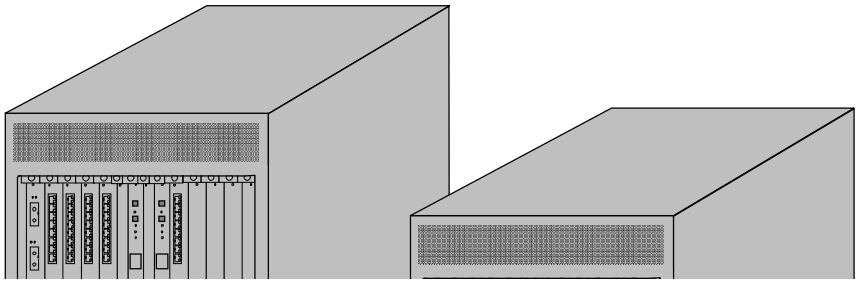


2. Follow the instructions illustrated in Figure 8-5.



8.2.4.1 Input Unit (AC or DC)

1. Turn off the breaker switch on the Input Unit and unplug the power cord from the Input Unit.
2. If the Input Unit is for AC input, detach the cover in front of the target Input Unit as illustrated in Figure 8-6.
3. Follow the other instructions illustrated in Figure 8-6. Although the figure shows the case of AC input, the same instructions apply to the case of DC input except the cover mentioned above.
4. If the Input Unit is for AC input, attach the cover detached in step 2. above.



2. Follow the instruction illustrated in Figure 8-7.

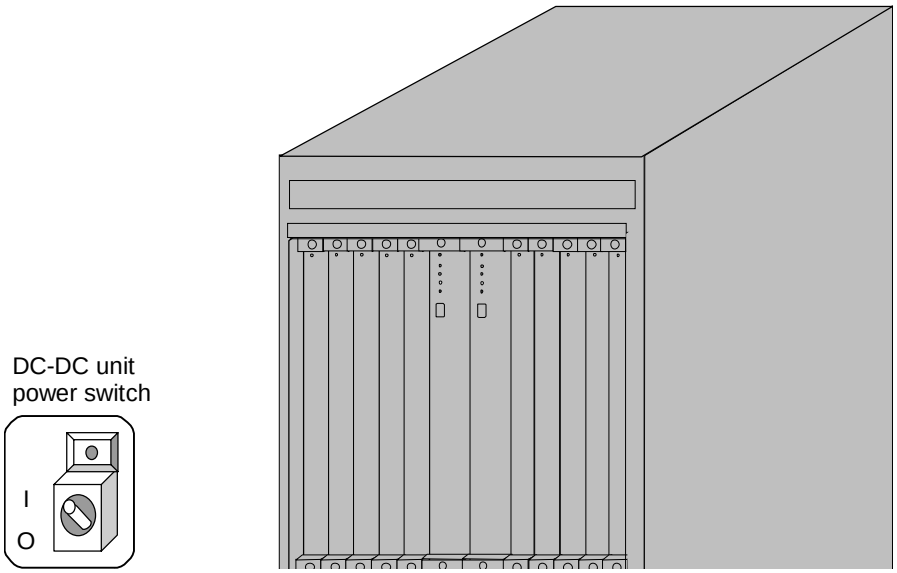
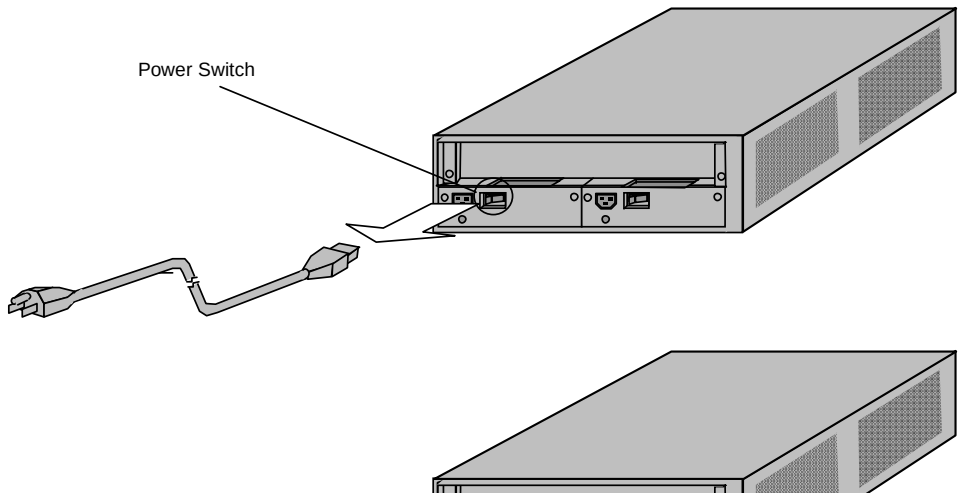


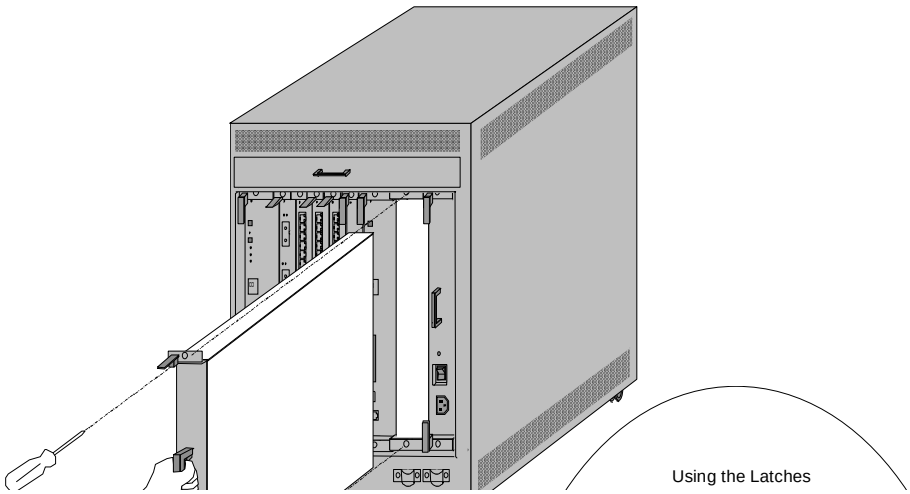
Figure 8-8 illustrates how to remove a POW from GR2000-4. The steps are as follows:

1. Turn off the power switch on the POW and unplug the power cord from the POW.
2. Demount the screws.
3. Remove the POW.



8.2.6.1 POW for AC Input

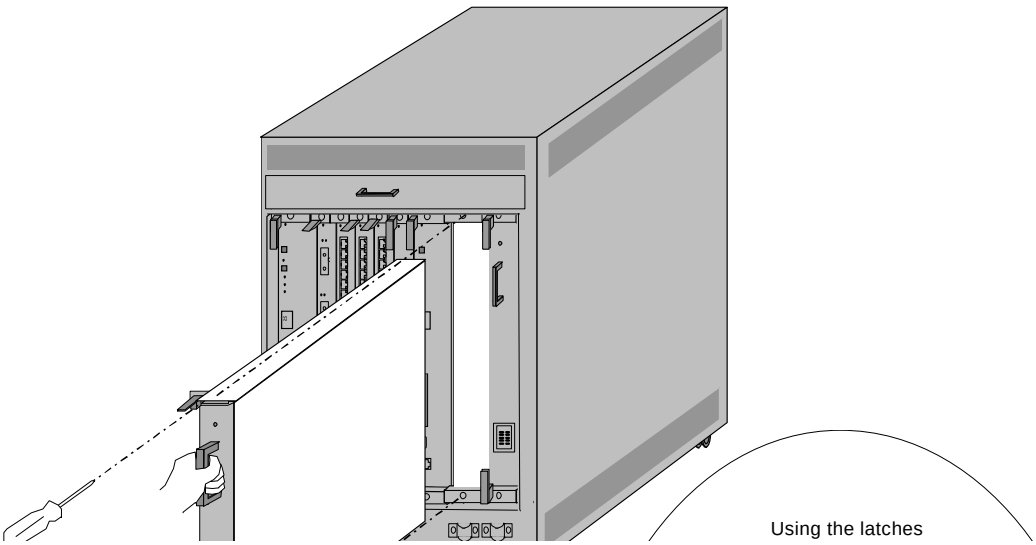
1. Turn off the power switch on the POW and unplug the power cord from the P
2. Follow the instructions illustrated in Figure 8-9.



Using the Latches

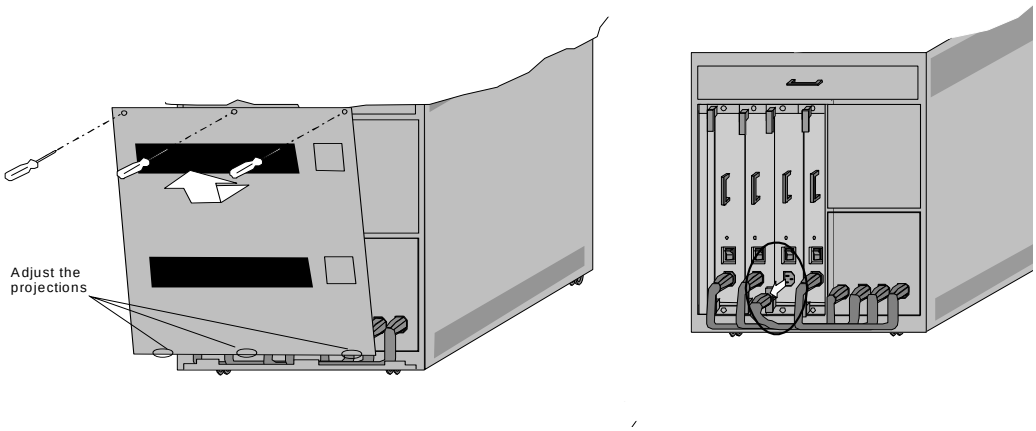
POW.

2. Follow the instructions illustrated in Figure 8-10.



8.2.7.1 POW for AC Input

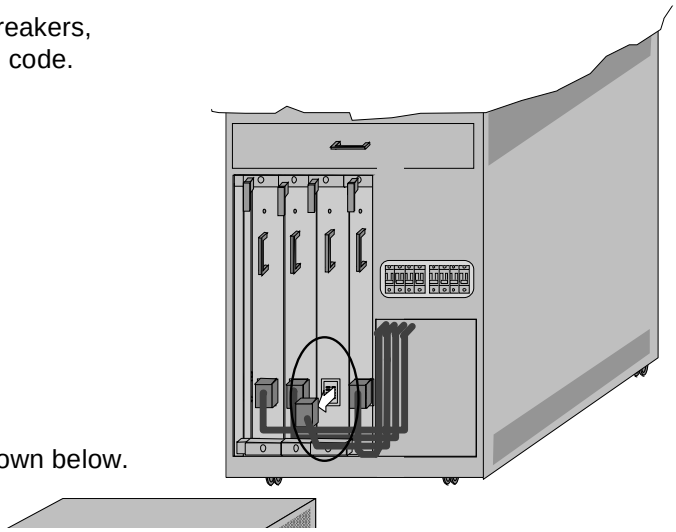
1. Turn off the power switch on the POW and unplug the power cord from the P
2. Follow the instructions illustrated in Figure 8-11.



POW.

2. Follow the instructions illustrated in Figure 8-12.

Power off the four pairs of circuit breakers, and remove the power connection code.



Procedures of install/remove are shown below.

To add or remove the fans to/from each model of GR2000 other than GR2000-2S refer to the following subsections.

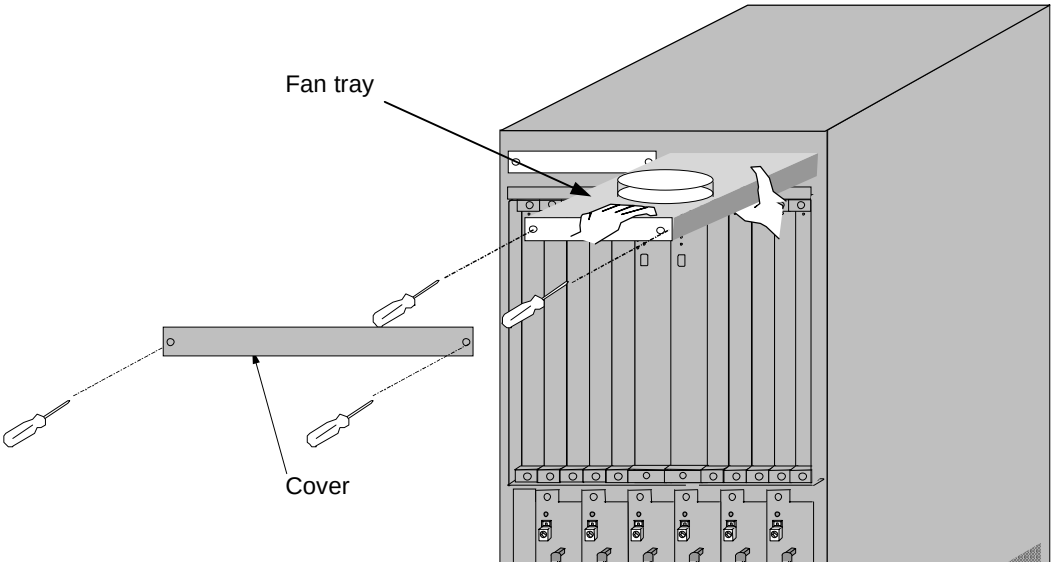
Note: The fans of GR2000-2S cannot be added or removed by the user because they are integral to chassis. When addition or removal of such a fan is necessitated on GR2000-2S, entrust work to trained service personnel.

Note: For models other than GR2000-2S, certain fans cannot be added or removed by the user. For fans not described in this section, entrust work to trained service personnel.

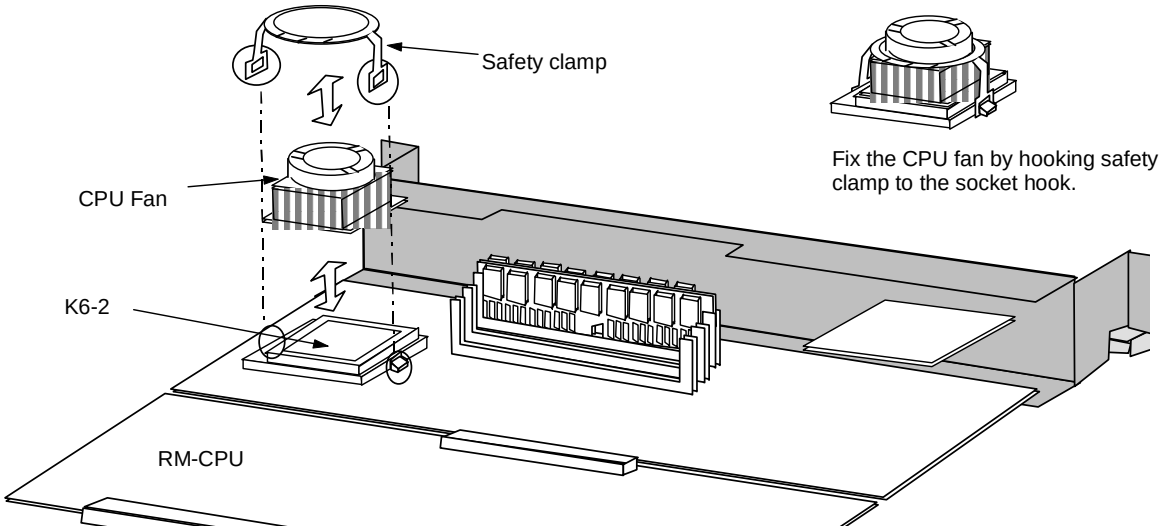
8.3.1 Fan Tray for GR2000-10H

To add or remove the fan tray for GR2000-10H, follow the instructions illustrated Figure 8-13.

To add or remove the fan tray for GR2000-20H, follow the instructions illustrated in Figure 8-14.



To add or remove the CPU fan for GR2000-4, GR2000-10, and GR2000-20, follow instructions illustrated in Figure 8-15. When adding, be sure to attach the safety clamp to the socket hook to anchor the CPU fan.

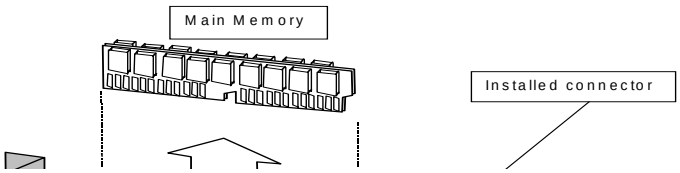


To add or remove the fans to/from each model of GR2000 other than GR2000-2S, refer to the following subsections.

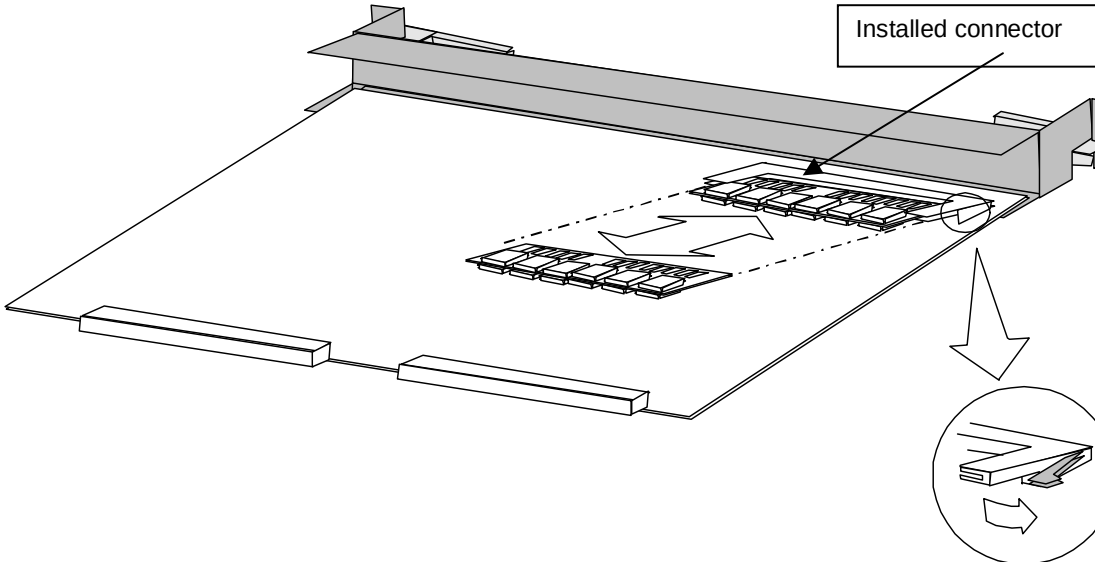
Note: The main memory modules of GR2000-2S cannot be added or removed by the user because RM-CPU and RMP of GR2000-2S are integral to chassis. When addition or removal of main memory module is necessitated on GR2000-2S, entrust work to trained service personnel.

8.4.1 Addition/Removal of Main Memory Module for RM (BCU)

To add or remove the main memory module for RM (BCU), follow the instructions illustrated in Figure 8-16.



To add or remove the main memory module for RP, follow the instructions illustra in Figure 8-17.



on or off. After completing this procedure, start up duplex mode from your terminal by entering:

```
[config:]modeset duplex[CR]
```

Note: When adding a standby BCU with power off, the above command is unnecessary because duplex mode is automatically detected and power turned on, unless you change duplex mode to simplex mode or press the EMA SUPRESS button.

8.5.1.2 Removing a BCU

The procedure is different depending on the purpose of removing a BCU: one is termination of duplex mode and the other is temporary maintenance stop.

For termination of duplex mode

To quit duplex mode and remove the standby BCU, change the operating mode first. From your terminal, enter:

```
[config:]modeset simplex[CR]
```

8.5.2.1 Adding an RP

To add an RP:

1. Mount the RP board in an empty RP slot.
2. To start the RP, enter the following command from your terminal:
   `[config:] maintenance free rp <rp_no>[CR]`

8.5.2.2 Removing an RP

To remove an RP:

1. Stop the RP by entering the following command:
   `[config:] maintenance close rp <rp_no>[CR]`
2. Even if the NIF under the RP is running, it will stop.
3. Make sure the LED on the RP is yellow.
4. Remove the RP board.

For further information about commands, see the *Operations Guide*.

8.5.3 Network Interface (NIF)

1. Stop the operation of the GBIC to be removed. Charge the following commands from the control terminal:
   [Input type] maintenance close nif <nif_no> line <line_no> (nif_no = NIF number being the object; line_no = LINE number being the object.) *1
2. If necessary, delete the applicable configuration defining information.
3. Confirm before the removal that the LED indication for GBIC of the line being the object has turned to yellow.

   *1 For details of the command, refer to the "Operation command reference", Volume 4; 3.1 Maintenance

Software Installation and Update

9.1 Introduction

The control software for the GR2000 is shipped pre-installed. While it is usually unnecessary to reinstall the software, there is a complete procedure for doing so, well as a procedure to update the software to another release. Use update and ins procedures below when replacing the software or installing it in a new MC:

- Install

  Use this procedure to install software on a new MC. All files are written to the MC. The configuration and user information uses the same settings as when shipped. Operation is temporarily suspended during installations or updates, preventing communication through the system.